GE Consumer & Industrial
Multilin

POWER METERING SYSTEM

Multi-Function Meter with Power Quality

Instruction Manual

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QMI # 005094

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EPM 5300 Series Meters

Chapter 1: AC Power Measurement

The economics of electric power distribution networking dictate several configurations of AC power transmission. The number of phases and voltage levels characterize these configurations.

1.1 Single Phase System

A **single phase system** is a basic two-wire system used in low power distribution applications, such as residential communities or offices. Typically, the voltage is 120V AC. For higher power requirements, such as small commercial facilities, the typical power configuration is two lines of 120V AC opposite in phase (see **Figure 1.1 B,** below).

This system produces 120 volts from line to neutral for lighting and small appliance use. The line-to-line voltage is 240V AC, used for higher loads such as water heaters, electric dryers, ranges and machinery.

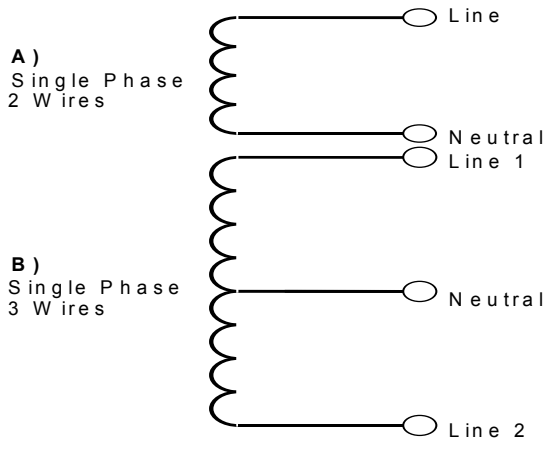


FIGURE 1–1: Single Phase System: (A) Two-Wire, (B) Three-Wire

The power (**W**) in a single phase system is:

$$W = E \bullet I \bullet \cos\Theta$$

E = potential, **I** = current, and **cos**Θ = phase difference between the potential and the current.

Power in a 120/240V AC system is:

$$W = (E_{Line\,1} \bullet I_{Line\,1} \bullet \cos\Theta) + (E_{Line\,2} \bullet I_{Line\,2} \bullet \cos\Theta)$$

Phase differential between the potential and the current results from a non-resistive load, either reactive or capacitive.

Reactive power (VAR): The additional power consumed that does not produce any work but must be delivered to the load: .

$$VAR = E \cdot I \cdot sin\Theta$$

This is a measure of the inefficiency of the electrical system.

Apparent power (VA): The total power delivered to the load, and the vector sum of real power and reactive power.

Power Factor (PF): The ratio between real power and apparent power:

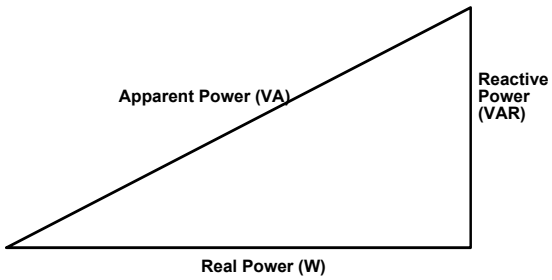


FIGURE 1–2: Relationship between apparent, real and reactive power

Ideal power distribution should have a PF of 1. This condition can be met only if no reactive power loads exist. In real life applications, many loads are inductive loads. Often, corrective capacitors are installed to correct Poor Power Factor (see Section 1.3).

1.2 Three-Phase System

A **three-phase system** delivers higher levels of power for industrial and commercial applications; the three phases correspond to three potential lines. A 120° phase shift exists between the three potential lines.

A typical configuration has either a Delta connection or a Wye connection (see **Figure 1.3,** below).

In a three-phase system, the voltage levels between the phases and the neutral are uniform and defined by:

$$E_{an} = E_{bn} = E_{cn} = \frac{E_{ab}}{\sqrt{3}} = \frac{E_{bc}}{\sqrt{3}} = \frac{E_{ac}}{\sqrt{3}}$$

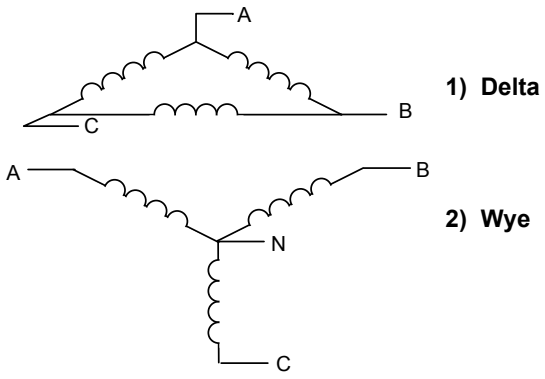


FIGURE 1–3: Three-Phase System: (1) Delta, (2) Wye

Voltages between the phases vary depending on loading factors and the quality of distribution transformers. The three-phase system is distributed in different voltage levels: 208V AC, 480V AC, 2400V AC, 4160V AC, 6900V AC, 13800V AC, and so on.

Power measurement in a poly phase system is governed by **Blondel's Theorem**. Blondel's Theorem states that in a power distribution network which has N conductors, the number of measurement elements required to determine power is N-1. A typical configuration of poly phase system has either a Delta connection or a Wye connection (see **Figure 1.4**, below).

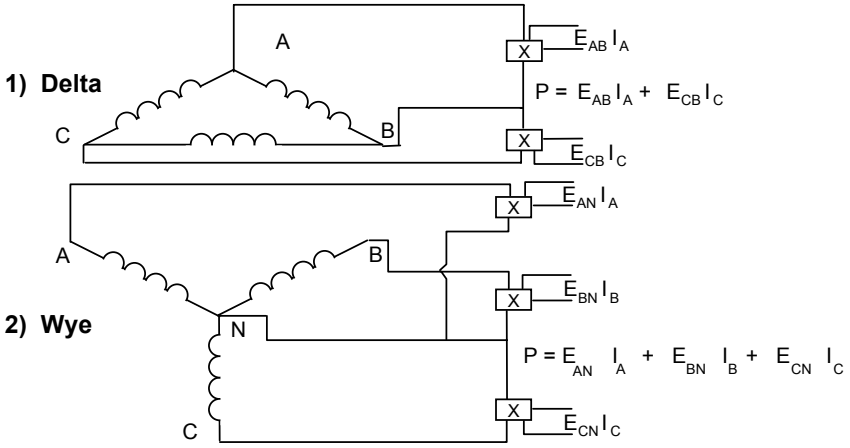


FIGURE 1–4: Poly Phase System: (1) Delta, (2) Wye

1.3 Consumption, Demand and Poor Power Factor

CONSUMPTION: $WH = W \times T$

W = instantaneous power **T** = time in hours

The total electric energy usage over a time period is the consumption of WH.

Typically, the unit in which consumption is specified is the kilowatt-hour (KWH): one thousand watts consumed over one hour. Utilities use the **WH** equation to determine the overall consumption in a billing period.

DEMAND: Average energy consumed over a specified time interval. The utility determines the interval, typically 15 or 30 minutes. The utility measures the maximum demand over a billing period. This measurement exhibits a deviation from average consumption, causing the utility to provide generating capacity to satisfy a high maximum consumption demand. The highest average demand is retained in the metering system until the demand level is reset.

POOR POWER FACTOR: Results in reactive power consumption. Transferring reactive power over a distribution network causes energy loss. To force consumers to correct their Power Factor, utilities monitor reactive power consumption and penalize the user for Poor Power Factor.

1.4 Waveform and Harmonics

Ideal power distribution has sinusoidal waveforms on voltages and currents. In real-life applications, where inverters, computers, and motor controls are used, distorted waveforms are generated. These distortions consist of harmonics of the fundamental frequency.

SINUSOIDAL WAVEFORM: $A \bullet \sin(\omega \cdot t)$

DISTORTED WAVEFORM:

$$A \bullet \sin(\omega \bullet t) + A_1 \bullet \sin(\omega_1 \bullet t) + A_2 \bullet \sin(\omega_2 \bullet t) + A_3 \bullet \sin(\omega_3 \bullet t) + \cdots$$

TOTAL HARMONIC DISTORTION (THD):

$$\%\ \text{of}\ \text{THD} = \frac{\text{RMS of Total Harmonic Distortion Signal}}{\text{RMS of the Fundamental Signal}} \times 100$$

HARMONIC DISTORTION: A destructive force in power distribution systems. It creates safety problems, shortens the life span of distribution transformers, and interferes with the operation of electronic devices. The Futura+ monitors the harmonic distortion to the 31st harmonic. A waveform capture of distorted waveform is also available.

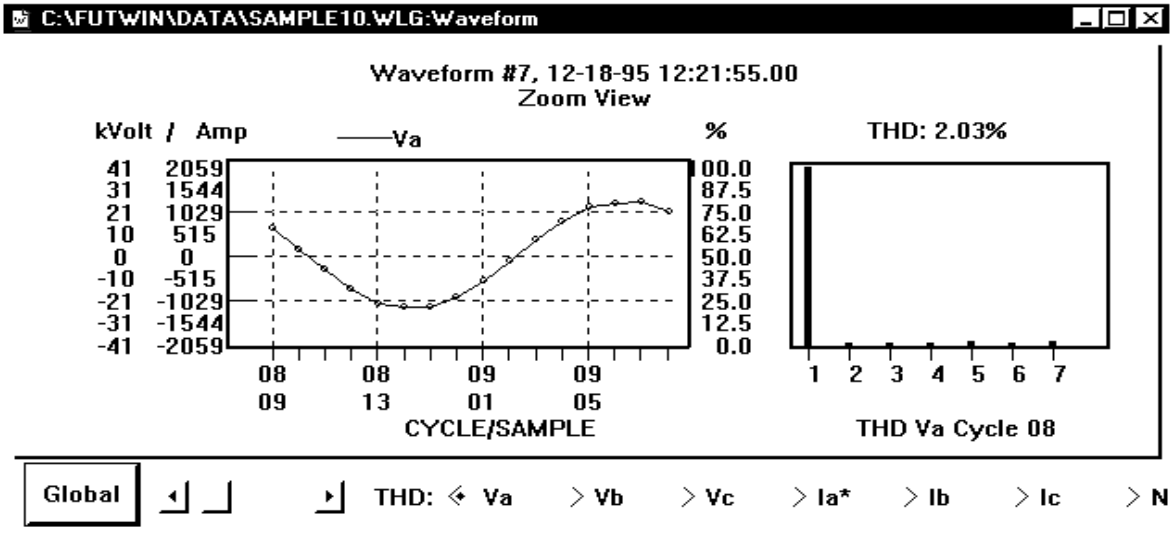


FIGURE 1–5: % THD GRAPH

EPM 5300 Series Meters

Chapter 2: Mechanical Installation

2.1 Mechanical Installation

These diagrams display the various possible mechanical installations and Communication Converter installation. The various models use the same hookup and installation.

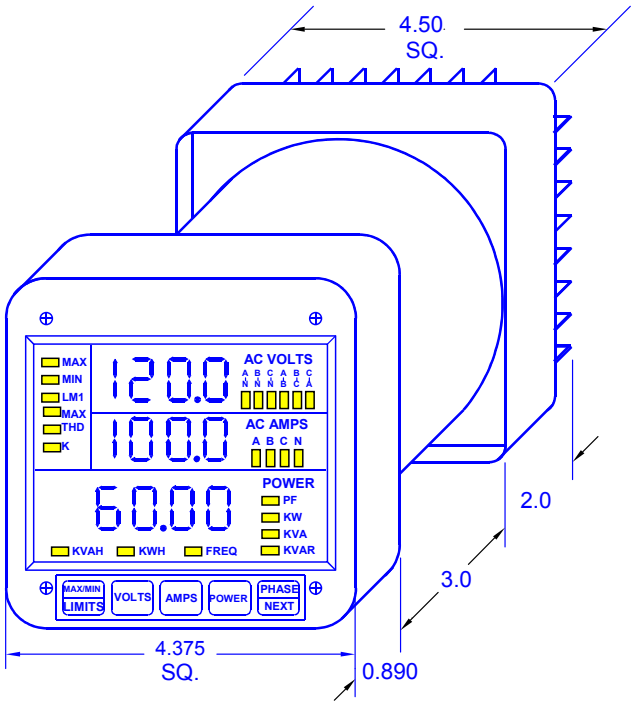


FIGURE 2–1: Standard installation

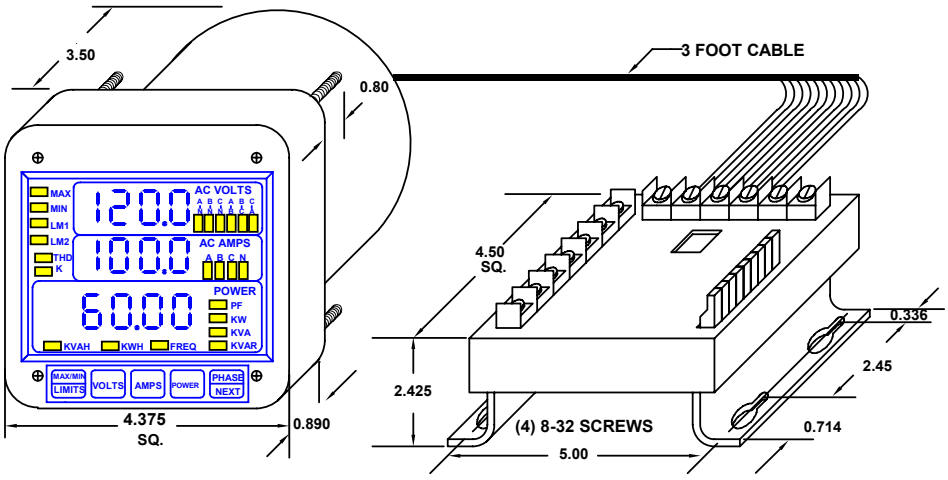


FIGURE 2–2: Installation with K-110 option for limited space conditions

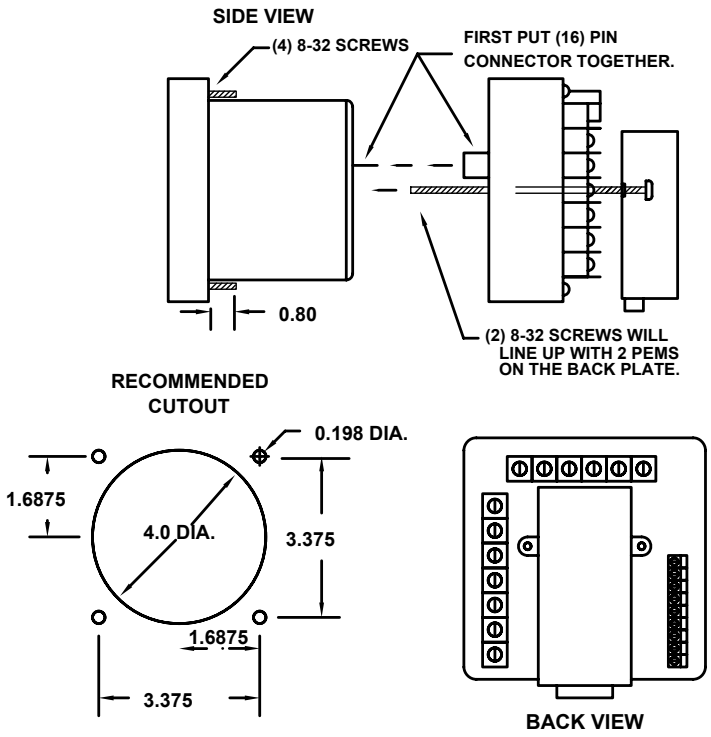


FIGURE 2–3: Standard cutout

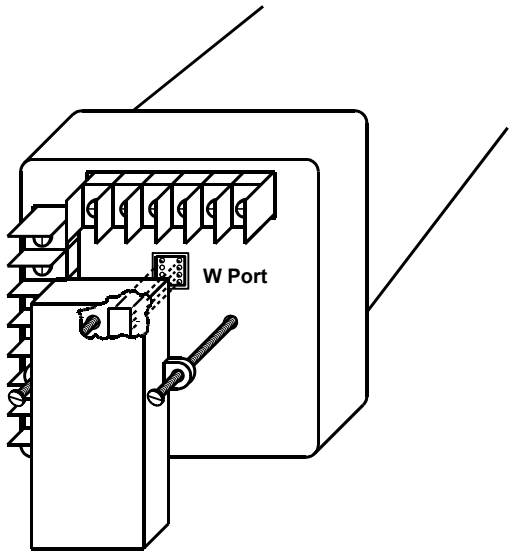


FIGURE 2–4: Optional Communication Converter or DC Output Module Installation

***** Recommended wire gauge is 20 AWG for DC Output or RS-485 options.

NOTE

Carefully line up the guide screw and 8 pin port connector to prevent pin breakage**.**

EPM 5300 Series Meters

Chapter 3: Electrical Installation

3.1 Connecting the Current Circuit

Install the wiring for the current at 600V AC insulation as a minimum. The cable connector should be rated for 6 Amps or greater and have a cross-sectional area of 16 AWG minimum.

Mount the current transformers (CTs) as close as possible to the meter for best accuracy. The following table illustrates the maximum recommended distances for various CT sizes, assuming the connection is via 16 AWG cable.

Table 3–1: CT Size and Maximum Distance

CT Size	Maximum Distance (CT to Meter)
2.5 VA	10 Feet
5.0 VA	15 Feet
7.5 VA	30 Feet
10.0 VA	40 Feet
15.0 VA	60 Feet
30.0 VA	120 Feet

WARNING

DO NOT leave secondary of the CT open when primary current is flowing. This causes high voltage that will overheat the secondary of the CT. Use a shorting block on the secondary of the CT.

3.2 CT Connection

If the meter is connected directly to the current (up to 10 Amps max.), maintain the exact connection to avoid incorrect polarity.

When the meter is connected using the CTs, you must maintain the correct CT polarities. CT polarities are dependent upon correct connections of CT leads, and upon the direction the CTs are facing when clamped around conductors. The dot on the CT must face the line side; the corresponding secondary connection must connect to the appropriate input on the meter. Failure to connect CTs properly results in inaccurate power readings. If your meter is not reading power properly, it is more than likely the CT is incorrectly wired.

CTs are shorted if connected to the terminal block model DSP2 or 3 even if it is detached from the meter.

3.2.1 Helpful Debugging Tools

Option 1: Isolating a CT Connection Reversal power reading

If your meter does not read the correct watts after installation, it almost always means that the CT's have been wired in the wrong polarity. To check the polarity of the CT after the monitor has been installed, look at the single phase WATT readings to see that each of the readings are positive (assuming you are consuming power). If one of the WATT readings is negative, that particular phase CT is reversed.

To check the single phase WATT reading, press the Power button twice while the annunciator is positioned to WATTS. Then press the Phase/Next button to cycle through the phases. After connecting the polarity of the CTs, the WATT and VAR readings should be correct.

Option 2: Isolating a CT Connection Reversal using Voltage Readings

- KW reading. It should be positive.
- If negative, reverse the CT wires on terminals 8 and 9.
- Connect terminal number 6 potential. If KW decreases to about zero, reverse CT wires on terminals 10 and 11.
- Connect terminal number 7 potential. If KW is one-third of expected reading, reverse CT wires to terminals 12 and 13.

3.3 Connecting the Voltage Circuit

For proper meter operation, the voltage connection *must* be maintained. The voltage must correspond to the correct terminal.

The cable required to terminate the voltage sense circuit should have an insulation rating greater than 600V AC and a current rating greater than 0.1 A.

3.4 Selecting the Voltage Fuses

We strongly recommend using fuses on each of the sense voltages and the control power, although connection diagrams do not show them. Use a 1 Amp fuse on each voltage input.

The meter can handle a maximum voltage of 150V phase to neutral. PTs are required for higher voltages. Suffix -G extends the maximum direct voltage to 300V phase to neutral, 600 volt phase to phase.

3.5 Connection to the Main Power Supply

The meter requires separate control power to operate. Listed are the five different power supply options and corresponding suffixes.

Table 3–2: Control Power and Current

CONTROL POWER	OPTION SUFFIX	CURRENT
120V AC	115 A	0.1 AAC
240V AC	230 A	0.05 AAC
12V DC	D4	0.10 ADC
24-48V DC	D	0.25-0.5 ADC
125V AC/DC (universal)	D2	0.10 AAC or DC

NOTE

For DC-powered units, polarity should be observed. Connect the negative terminal to L and positive terminal to L1. An earth ground connection to chassis is mandatory for normal operation (terminal three). Do not ground the unit through the negative of the DC supply.

NOTE

Externally fuse power supply with a slow-blow 3 Amp fuse.

3.6 Electrical Connection Installation

Choose the diagram that best suits your application and maintain the CT polarity. Follow the outlined procedure to verify correct connection.

NOTE **IMPORTANT: For PT connections only, short terminals 3 and 4.**

NOTE **Connect local ground to terminal 3. This protects the unit from spikes and transients.**

- The meter and terminal module DSP3 are factory calibrated together; the serial numbers are matched on both. The DSP3 input module and the meter base MUST MATCH!
- Mismatching of the meter and DSP3 input module will cause inaccurate readings because calibration ratios are stored in the meter's memory, not in the DSP3 input module.

3.6.1 List of Connection Diagrams

NOTE See phase reversal if a message of CBA appears after installation.

Fig 3-1	Three-Phase, Three-Wire System Delta with Direct Voltage and CTs
Fig 3-2	Three-Phase, Three-Wire Open Delta with two CTs and two PTs (*Open Delta System should only be used if the electrical system is a 3-wire 2 PT OPEN DELTA* *Open Delta can be enabled or disabled in Programming GROUP 0, FUNCTION 3, Chapter 9, section 9.4*)
Fig 3-3	Three-Phase, Three-Wire Open Delta with three CTs and two PTs
Fig 3-4	Three-Phase, Four-Wire Wye with Direct Voltage and CTs
Fig 3-5	Three-Phase, Four-Wire Wye with CTs and PTs
VI	Single Phase with CT and PT Connection
VII	Dual-Phase System
VIII	Three Phase System

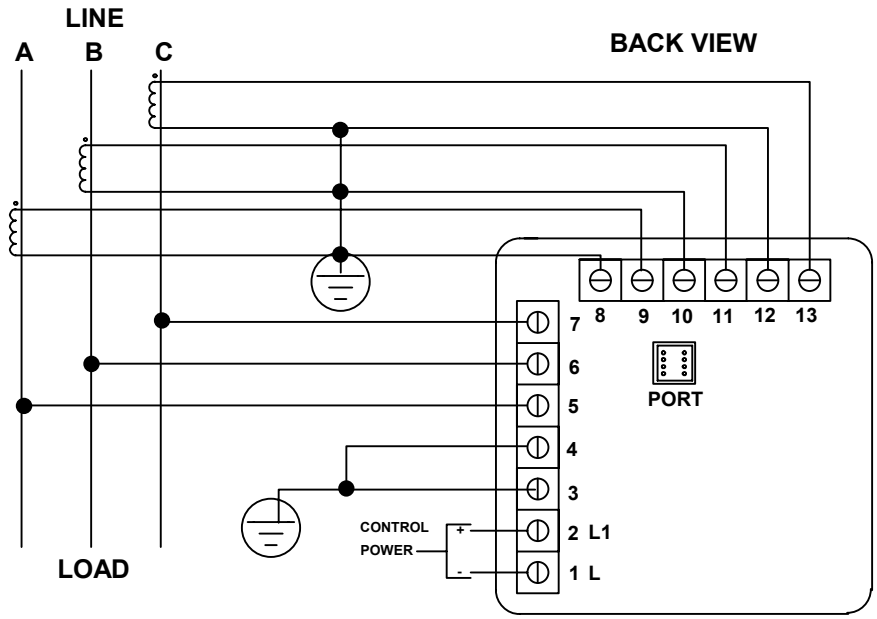


FIGURE 3–1: Three Phase, Three-Wire System Delta with Direct Voltage and CTs

NOTE

Remember to make sure Open Delta bit is programmed in the meters (See Chapter 9).

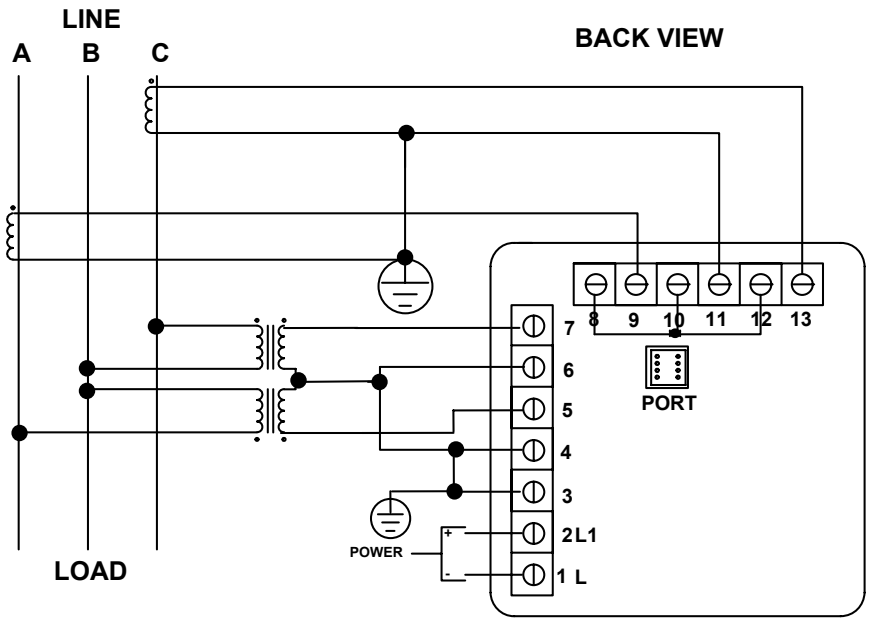


FIGURE 3–2: Three-Phase, Three-Wire Open Delta with two CTs and two PTs

NOTE

Remember to make sure Open Delta bit is programmed in the meter (see section 9.4).

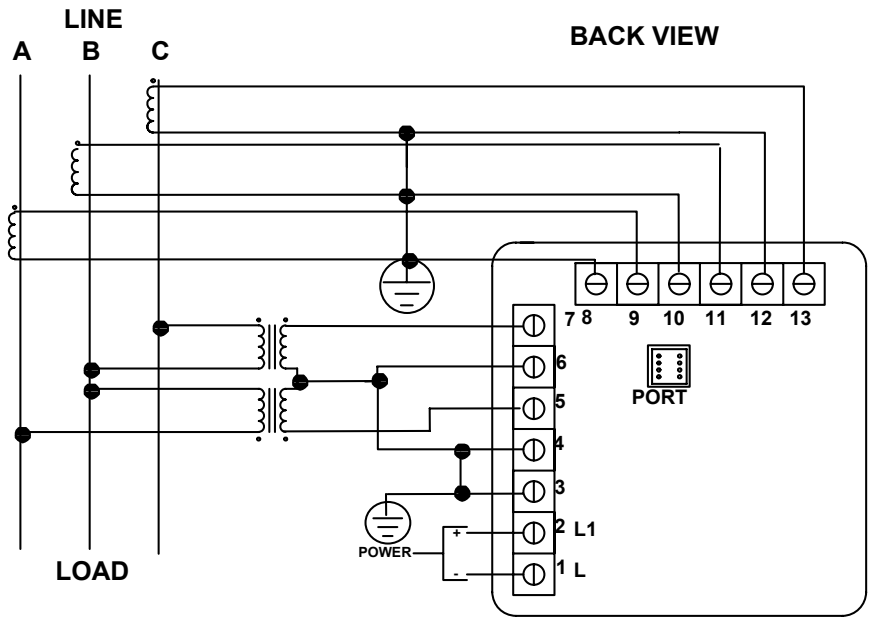


FIGURE 3–3: Three-Phase, Three-Wire Open Delta with three CTs and two PTs

NOTE

Remember to make sure Open Delta bit is programmed in the meter (see Chapter 9).

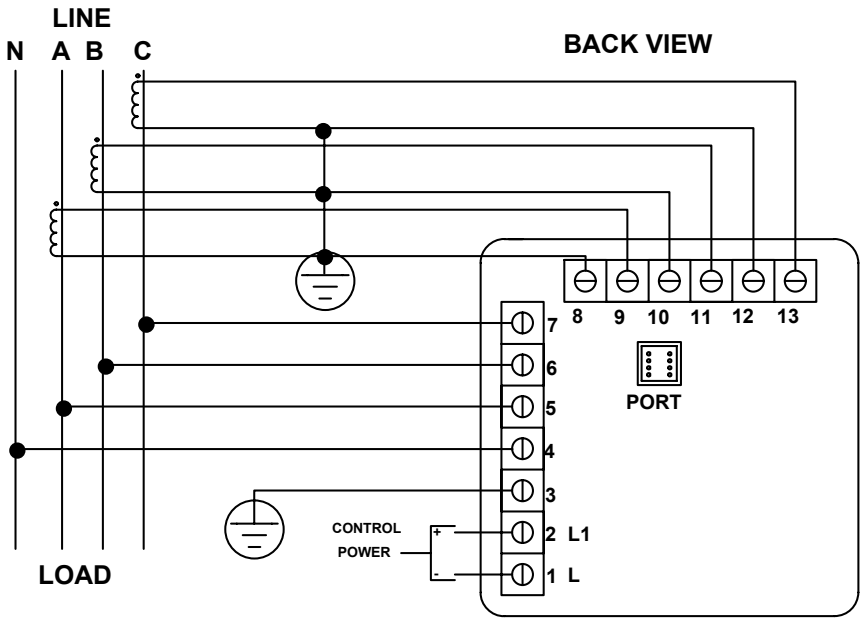


FIGURE 3–4: Three-Phase Four-Wire Wye with Direct Voltage and CTs

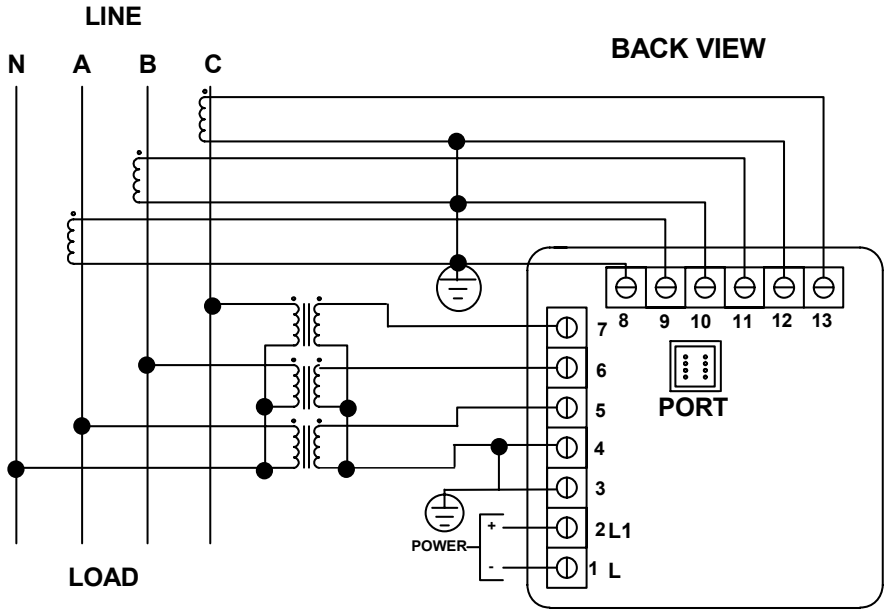


FIGURE 3–5: Three Phase Four-Wire Wye with CT and PTs

3.7 The EPM 5300P-S

The EPM 5300P-S is essentially the 5300P, where through the Programming Mode calculations are changed to reflect either **Single Phase** or **Dual Phase** readings.

Single Phase—The connection **MUST** be identical to Diagram VI.

Dual Phase—The connection **MUST** be identical to Diagram VII.

Program 1 for **Single Phase** or 2 for **Dual Phase** in GROUP 0, FUNCTION 7 to remove **Three-Phase** indicators from view.

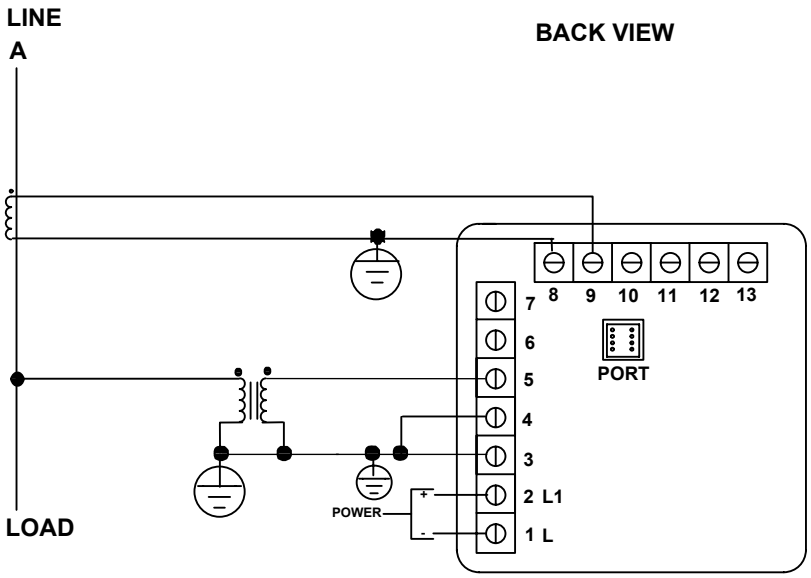


FIGURE 3–6: Single Phase with CT and PT Connection

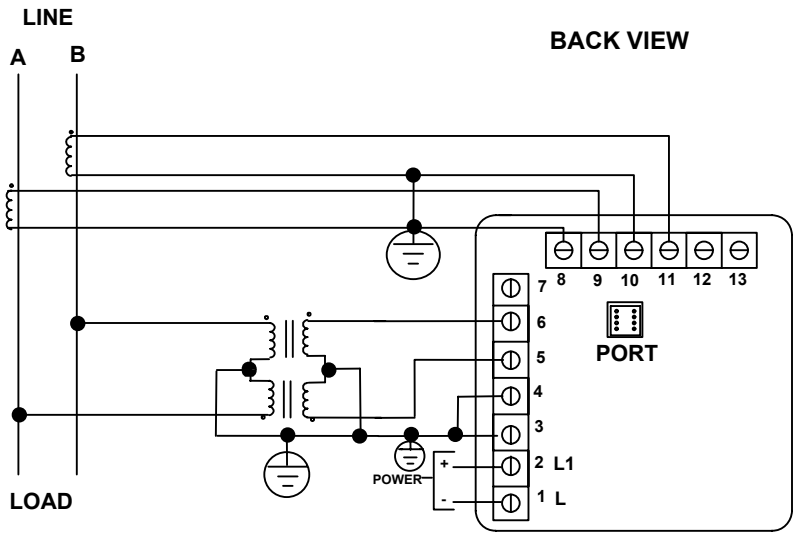


FIGURE 3–7: Dual-Phase with CTs and PTs

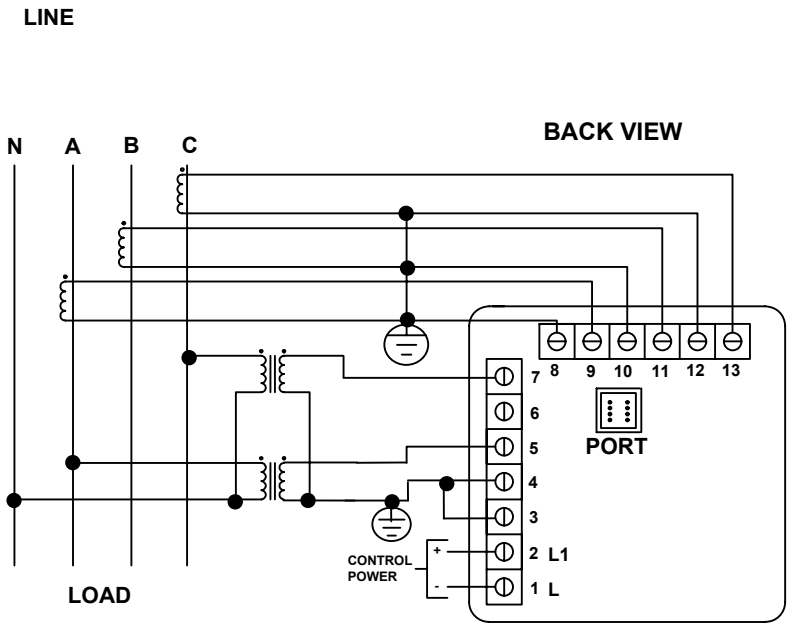


FIGURE 3–8: Three-Phase Four-Wire WYE with 2.5 Element

NOTE

The 2.5 element option must be custom configured from the factory. You must pre-order this configuration.

3.8 Relay, Protection and Pulse Output

(This section applies only to the -NL or -NL2 Relay Option.)

3.8.1 EPM 5300P Relay Overview

The EPM 5300P offers dry contact relay output capability. The EPM 5200P only offers KYZ pulse outputs and cannot be configured to trip contacts on events.

FAIL-SAFE MODE: The EPM 5300P -NL option gives the user an adjustable tripping bandwidth. The user specifies a range over which functions, such as frequency, phase relation and voltage, are acceptable. The relay releases during times of normal operation, and engages when functions are outside specified normal levels. The relay can be programmed to engage during normal operating conditions, and release outside specified normal range (particularly when power is lost). This is the **fail-safe mode**.

HYSTERISIS: The EPM 5300P -NL option also includes adjustable **hysterisis**. In addition to a time delay on activating any contact, the user may specify a lower level to release the relay, rather than releasing after the initial alarm point. This is ideal during load shedding when an alarm activates at a certain level and the user does not want to turn off the alarm until a much lower, safer level.

SETABLE DELAYS: After reaching the alarm point, a change in relay status may be delayed for 255 seconds. The user also has the option of allowing the device to change relay status without any delay. After the alarm condition passes, the relay can be stopped from returning to a normal condition for a programmable time. Each delay time is independent of one another.

AND/OR LOGIC: If several parameters are assigned to one relay, the user can trip the relay if all functions are out of limit (and programming), or if one function is out of limit (or programming). For example, if limits on Voltage, Kilowatts, and Phase Imbalance are programmed and tied to Relay 1, the user can either trip the relay if one function is out of limit, or if all functions are out of limit.

3.8.2 2 Relays & 1 KYZ Pulse Output -NL OPTION

The EPM 5300P's flexibility accesses a variety of relay options through the Programming Mode (see programming sections). The relay option package consists of three relays: two can be dedicated to alarm or controlled through communication (or both) and one for KYZ pulse output.

If the relays are controlled through communication, there are two different modes:

- Lock ON: Relay will not be affected by any alarm condition.
- Lock OFF: Relay will not be affected by any alarm condition.

If the relays are used for communication and alarm, there are four different modes:

- Lock ON: Relay stays on regardless of any alarm condition.
- Lock OFF: Relay stays off regardless of any alarm condition.
- Free ON: Relay turns on unless other conditions force it off.
- Free OFF: Relay turns off unless other conditions force it on.

Relay connection (see Figure 3.6, below): Form C relays, rated 250V, 5A–*2 each.*

KYZ relay output (Form C), rated 200V, 100mA–*1 each.*

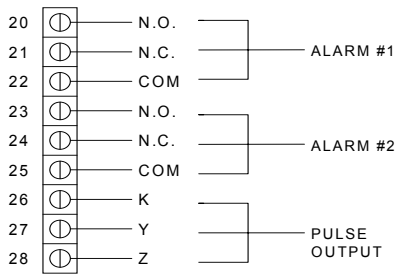


FIGURE 3–9: Close-up of the Relay and KYZ pulse output on the rear panel.

NOTE

Note: The relays shown in the figure above are in the NOT energized state.

The instrument detects two levels of alarm for the following functions:

- Voltage: AN, BN, CN, AB, BC, CA
- Current: A, B, C, N
- Over and Reverse Power
- Under PF/KVAR Lead or Lag
- Over KVA
- Voltage Imbalance (One level only)
- Over/Under Frequency
- Voltage Phase Reversals (One level only)
- Over/Under %THD (Available only with option –H)
- Over/Under K-Factor

KYZ RELAYS: Provides pulses for energy management systems or any other type of recording device. These pulses represent accumulated watt-hour, negative watt-hour, or VA-hour. Accomplish this assignment through the Programming Mode (see programming sections). The pulse value is determined by the decimal increment of the power function assigned to the pulse. The EPM 5200P can be equipped with KYZ pulse outputs.

NOTE

Unless otherwise specified, standard KYZ setup represents positive watt hour. See table below for standard rate. The scale factor for wattage (KW or MW) and Full Scale Decimal Point Placement is selectable in Programming Mode GROUP 1, FUNCTION *2*. Follow the Decimal Point Placement corresponding to the Change in Level. A multiplication or division factor can be programmed. See Programming GROUP 0, FUNCTION 6 for a different rate.

3.8.3 Standard Rate Table for Watts*

Decimal Point Placement (Kw/mw)	Change in Level
9999.000	1.0 Units W-Hour
999.900	0.1 Units W-Hour
99.990	0.01 Units W-Hour
9.999	0.001 Units W-Hour

*Units can be Kilowatts or Megawatts.

3.9 KYZ Pulse Outputs: NL2 Option

The -NL2 option for the meter is equipped with *three* KYZ outputs. KYZ relays provide pulses for energy management systems or any other type of recording device. These pulses represent accumulated positive watt-hour, negative watt-hour, VA-hour, positive VAR-hour, or negative VAR-hour. Accomplish this through Programming Mode GROUP 0, FUNCTION 6. The pulse value is dependent upon the Decimal Point Placement and is determined by the decimal increment of the power function assigned to the pulse. Refer to the situation that applies to the meter setting.

NOTE

Unless otherwise specified, standard KYZ setup for Pulse Output 0 is positive Watt Hour, Pulse Output 1 is negative Watt-Hour, and Pulse Output 2 is VA-hour. See table below for standard rate.

NOTE

With Option R (available only with the EPM 5200P) the setup for Pulse Output 0 is positive Watt-Hour, Pulse output 1 is positive VAR-hour, and Pulse output 2 is negative VAR-hour.

The scale factor for Wattage (KW or MW) and Full Scale Decimal Point Placement is selectable in Programming Mode GROUP 1, FUNCTION *2*. Follow the Decimal Point Placement corresponding to the Change in Level. A multiplication or division factor can be programmed. See Programming GROUP 0, FUNCTION 6 for a different rate.

Table 3–3: Standard Rate Table for Watts*

DECIMAL POINT PLACEMENT (KW/MW)	CHANGE IN LEVEL
9999.0	1.0 Units W Hour
999.9	0.1 Units W Hour
99.99	0.01 Units W Hour
9.999	0.001 Units W Hour

*Units can be KiloWatts or MegaWatts.

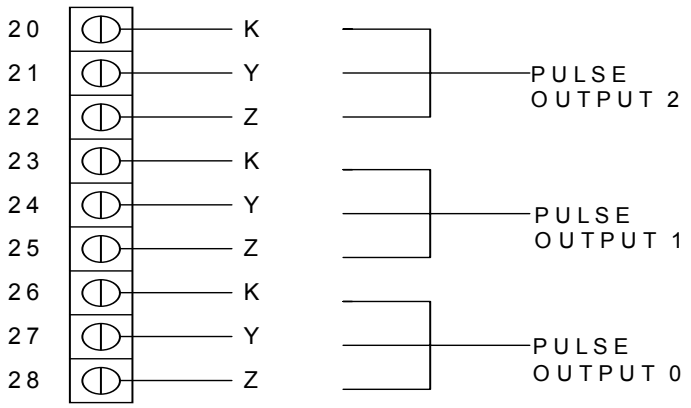


Figure 3-1: KYZ Relay Connection for -NL2 Option

KYZ relay output (Form C), rated 200V, 100mA: *3 separate KYZ Outputs (labeled 0 through 2).*

EPM 5300 Series Meters

Chapter 4: Communication Installation

4.1 RS-232C

(This section applies to the RS-232C or RS-485.)

All EPM 5300P and 5200P instruments can be equipped with RS-232C or RS-485 communication.

RS-232C communication links a single instrument with a computer or device such as an RTU or PLC. Its capability is up to 100 feet. A standard 9-pin female serial port connector mounts on the instrument for direct connection to a computer with a 9-pin cable.

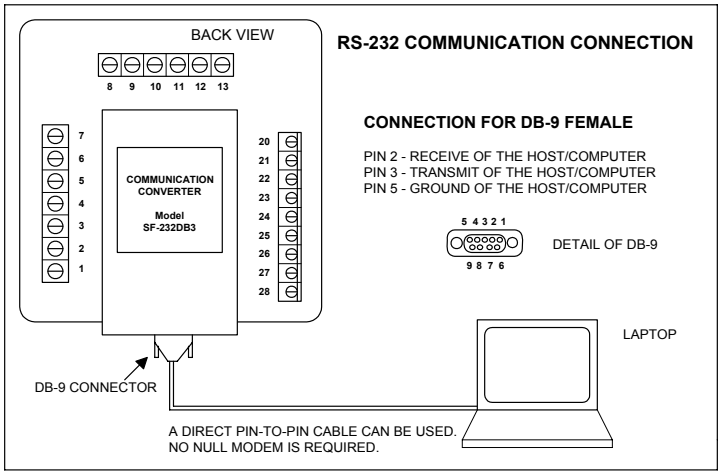

BACK VIEW
8 9 10 11 12 13
7 6 5 4 3 2 1
20 21 22 23 24 25 26 27 28
COMMUNICATION CONVERTER
Model SF-232DB3
RS-232 COMMUNICATION CONNECTION
CONNECTION FOR DB-9 FEMALE
PIN 2 - RECEIVE OF THE HOST/COMPUTER
PIN 3 - TRANSMIT OF THE HOST/COMPUTER
PIN 5 - GROUND OF THE HOST/COMPUTER
5 4 3 2 1
9 8 7 6
DETAIL OF DB-9
LAPTOP
DB-9 CONNECTOR
A DIRECT PIN-TO-PIN CABLE CAN BE USED.
NO NULL MODEM IS REQUIRED.

FIGURE 4–1: RS-232C Communication Connection Installation

NOTE

To avoid ground loops, the neutral and safety ground (pin 3) should be connected together at only one point.

4.2 RS-485

Each EPM 5300P or 5200P instrument has a unique address up to four digits long. This allows the user to communicate with up to 10,000 instruments. Available standard baud rates are 1200, 2400, 4800, and 9600. To select the proper baud rate, apply the following rules:

The unit operates up to 9600 baud. For a smaller number of instruments over a long distance, use a lower baud rate. Optimal recommended baud rate is 1200 baud, if noisy conditions exist.

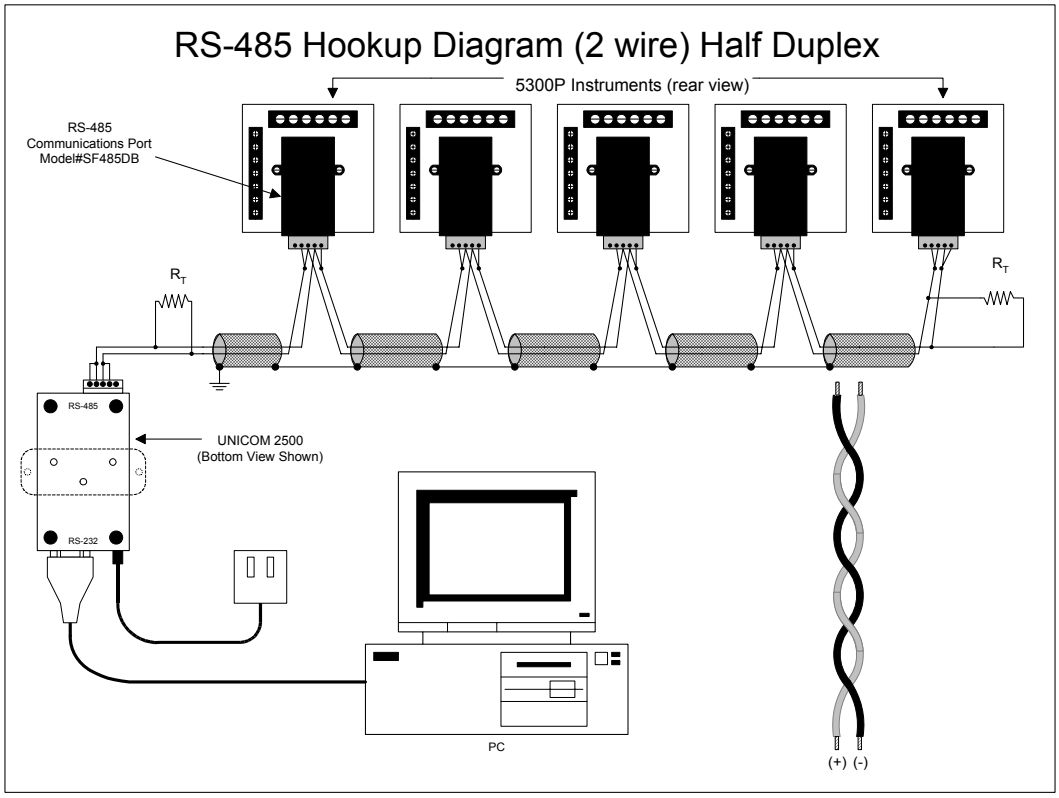


FIGURE 4–2: 2-Wire RS-485 Communication Connection Installation half duplex

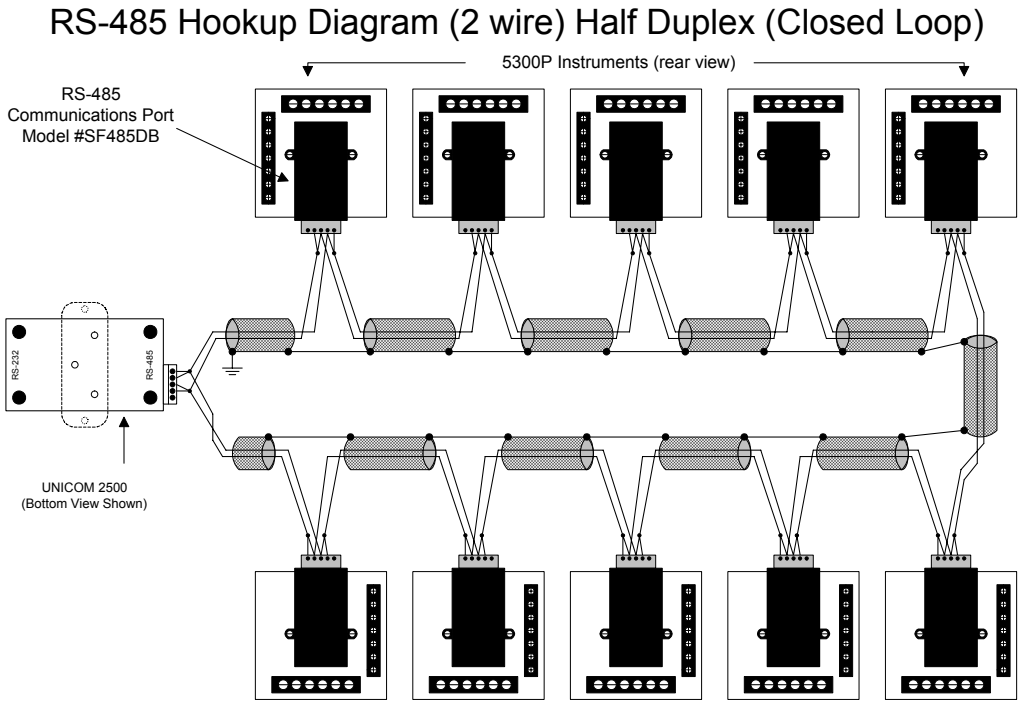


FIGURE 4–3: 2-Wire RS-485 Communication Connection Installation half duplex (closed loop)

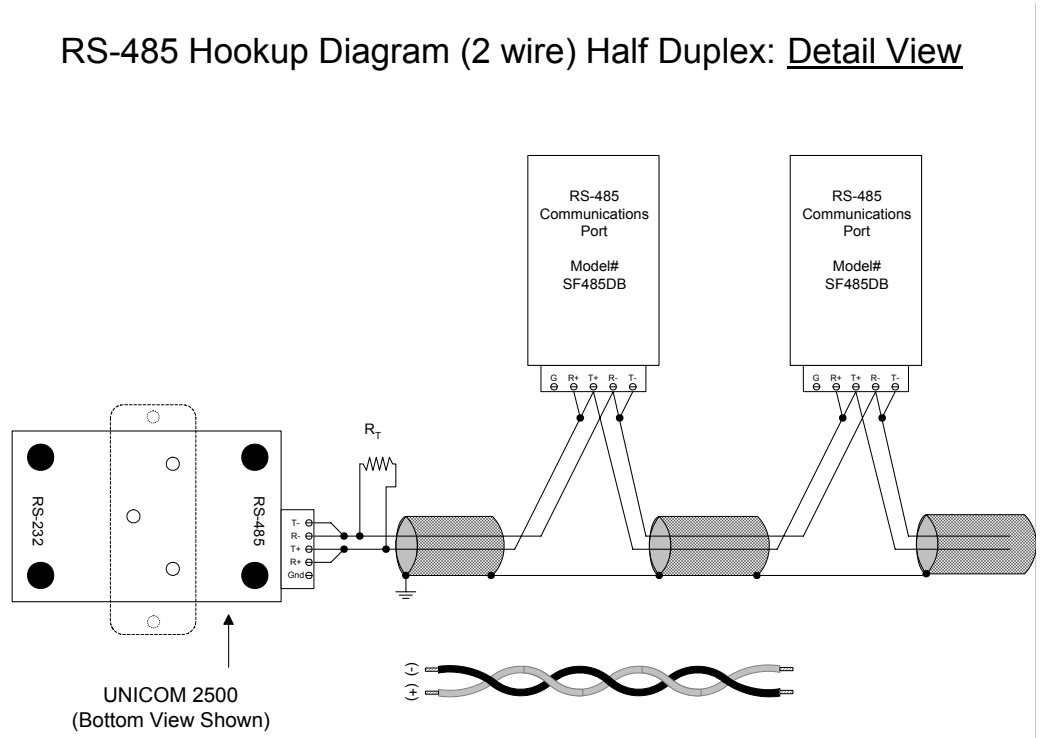


FIGURE 4–4: 2-Wire RS-485 Communication Connection Installation half duplex, detail view

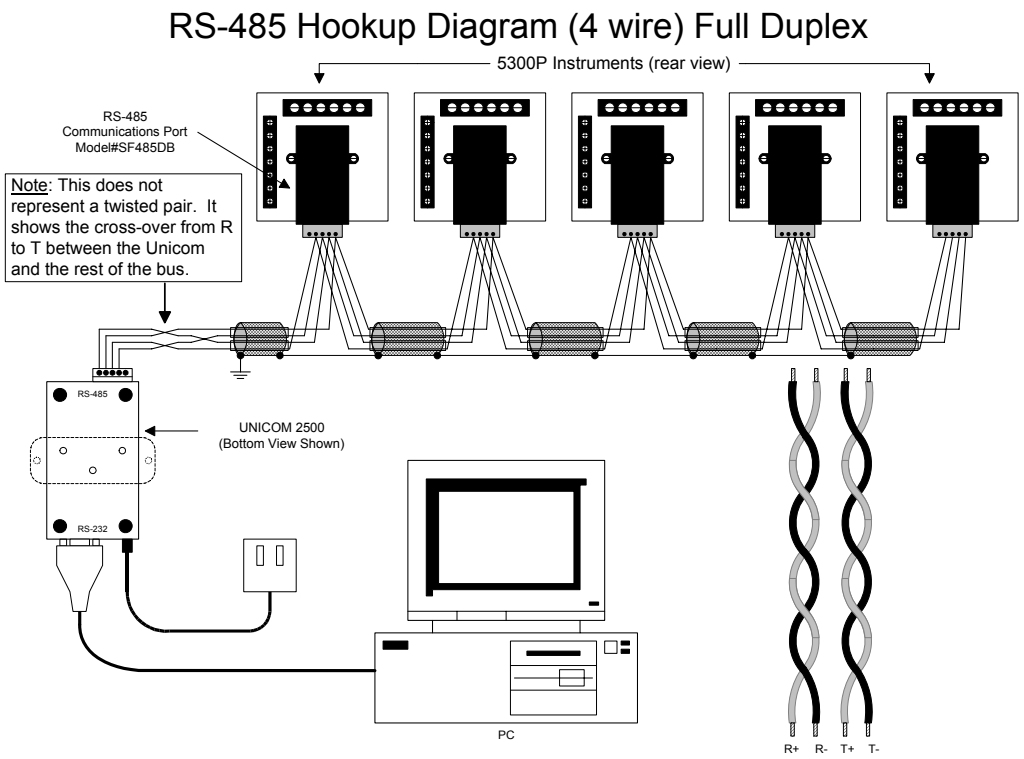


FIGURE 4–5: 4-Wire RS-485 Communication Connection Installation full duplex

Connecting 4-Wire bus to RS-485 Port:

- Connect the T- wire of the Unicom 2500 to the R- on the RS-485 port
- Connect the R- wire of the Unicom 2500 to the T- on the RS-485 port
- Connect the T+ wire of the Unicom 2500 to the R+ on the RS-485 port
- Connect the R+ wire of the Unicom 2500 to the T+ on the RS-485 port

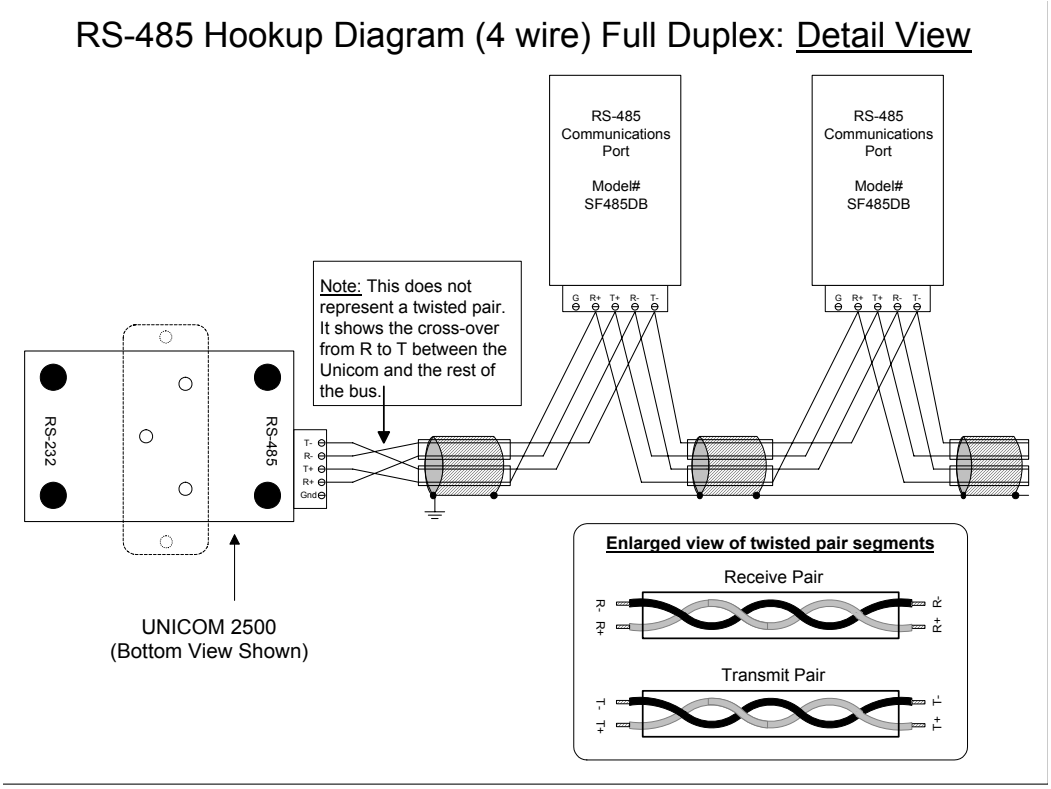


FIGURE 4–6: 4-Wire RS-485 Communication Connection Installation full duplex, detail view

Connecting 4-Wire bus to RS-485 Port:

- Connect the T- wire of the Unicom 2500 to the R- on the RS-485 port
- Connect the R- wire of the Unicom 2500 to the T- on the RS-485 port
- Connect the T+ wire of the Unicom 2500 to the R+ on the RS-485 port
- Connect the R+ wire of the Unicom 2500 to the T+ on the RS-485 port

4.3 Network of Instruments and Long Distance Communication

The RS-485 Transceiver is required for a large network of instruments.

- In a two-wire connection, a maximum of 900 instruments can be included in the same network (**Figure 4.7**)
- In a four-wire connection, a maximum of 3600 instruments can be included in the same network (**Figure 4.8**).

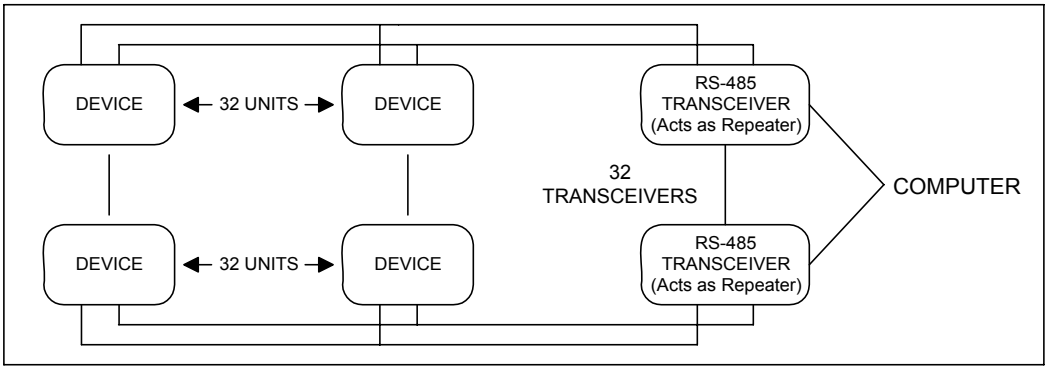


FIGURE 4–7: 2-Wire RS-485 Communication Installation Connection with Transceiver

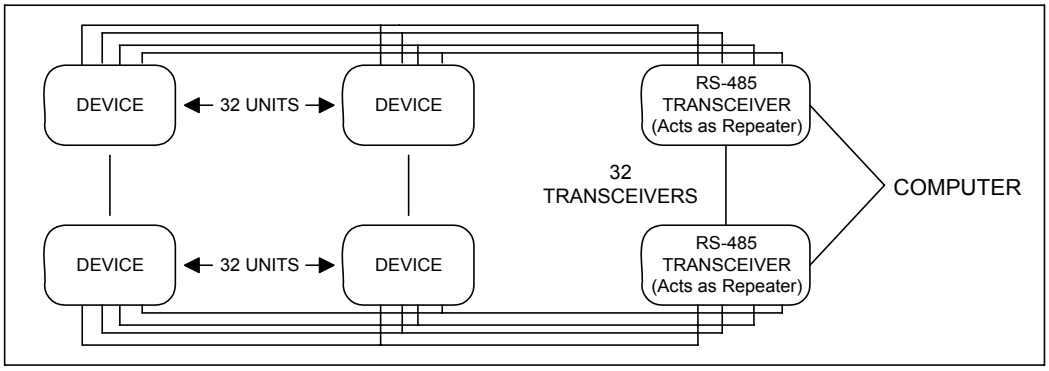


FIGURE 4–8: 4-Wire RS-485 Communication Installation Connection with Transceiver

Use modems (dedicated or dial-up) when the instruments are located at great distances. However, set the modem to auto answer at the recommended value of 1200 baud rate, if noise conditions exist. Also, flow control must be disabled.

You may want to use a Modem Manager RS485-RS232 Converter

When speaking to most RS-485 or RS-232C based devices, the remote modem must be programmed for the communication to work. This task is often quite complicated because modems are quirky when talking to remote devices. To make this task easier, EIG has

designed a **Modem Manager** RS-485 to RS-232C converter. This device automatically programs the modem to the proper configuration. Also, if you have poor telephone lines, modem manager acts as a line buffer, making the communication more reliable.

4.3.1 Modem Connected to Computer (Originate Modem)

Programming the Modem

Comply with the modem's instruction manual and follow these instructions:

Restore modem to factory settings:

This procedure erases all previously programmed settings.

Set modem to display result codes:

The device uses the result codes.

Set modem to verbal result code:

The device uses the verbal codes.

Set modem to ignore DTR signal:

Necessary for the device to ensure connection with originate modem.

Set modem to disable flow control:

Necessary to communicate with remote modem connected to device.

Tell modem to write the new settings to activate profile:

Places these settings into nonvolatile memory; the settings take effect after the modem powers up.

4.3.2 modem Connected to the Device (Remote Modem)

Programming the Modem

Comply with the modem's instruction manual and follow these instructions:

Restore modem to factory settings:

This procedure erases all previously programmed settings.

Set modem to auto answer on N rings:

Sets the remote modem to answer the call after **n** rings.

Set modem to Auto Negotiate mode:

Sets the remote to auto negotiate to communicate successfully with EPM 5300P and other devices in the modem.

Set modem to return numeric result codes:

Increases speed connection with EPM 5300P.

Set modem to ignore DTR signal:

Necessary for device to ensure connection with originate modem.

Set modem to disable flow control:

Necessary to communicate with remote modem connected to EPM 5300P.

Tell modem to write the new settings to activate profile:

Places new settings into nonvolatile memory; settings take effect after the modem powers up.

Debugging Communication Problems

If you experience NO communication, check these conditions:

- Is the Baud Rate set correctly (see Part II: Programming Section)?
- Is the Meter Address set correctly (see Part II: Programming Section)?
- Is the correct protocol set? Modbus, DNP 3.0?
- Set the meter for the appropriate protocol for the internal software.

EPM 5300 Series Meters

Chapter 5: Overview

The EPM 5300P displays 17 instantaneous electrical parameters. Values for each parameter are accessed through the keypad on the meter's front panel (see **Figure 5.1**). The EPM 5200P accesses information in the same manner as the 5300P. The key strokes for each model are identical.

Volts	Amps	Power A, B, C
A-N	A	± KW
B-N	B	± KVAR
C-N	C	KVA
A-B	N	± PF
B-C		Freq
C-A		± Total KWH Total KVAH (N/A on EPM 5200P)

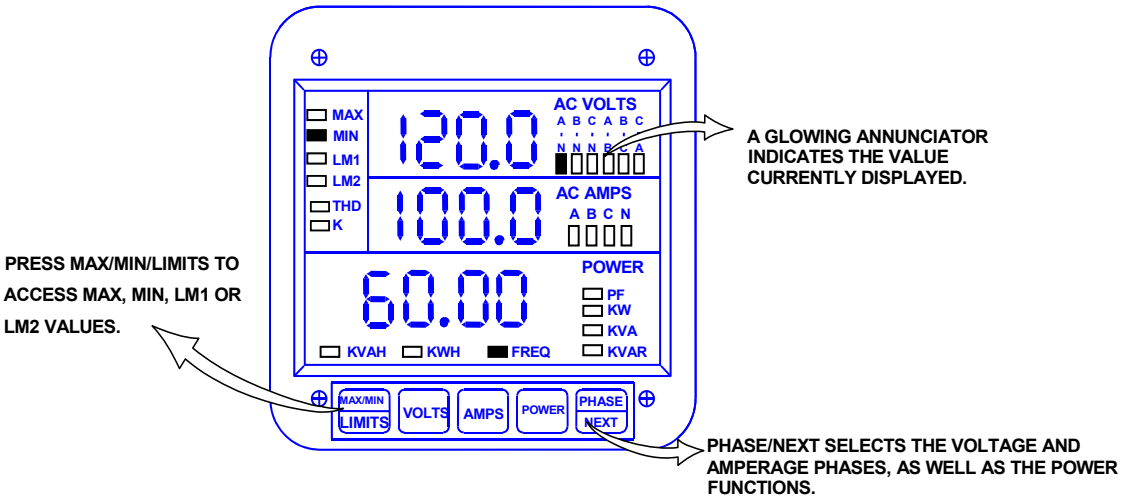
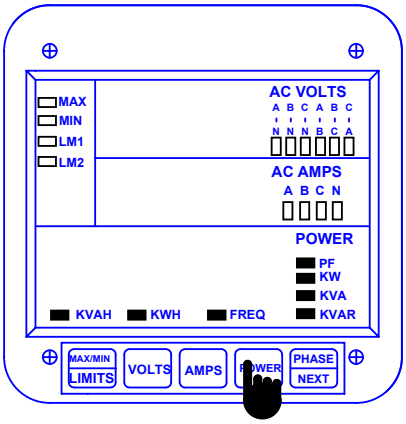


FIGURE 5–1: The EPM 5300P front panel with display and keypad

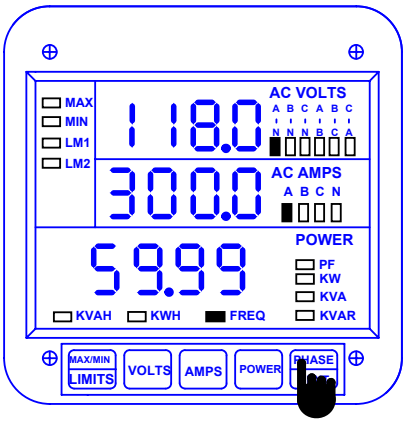
5.1 Accessing the Power Functions



Step 1:

a. Press ***POWER*** to select the power category.

⇨The display blanks and all annunciators in the power section glow, confirming selection.



Step 2:

a. Press ***PHASE/NEXT*** for the desired power function.

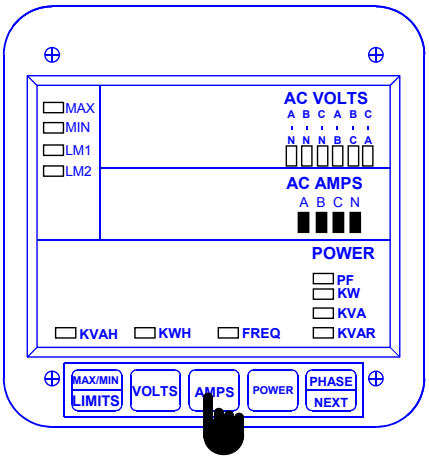
⇨The functions are accessed in a clockwise sequence.

NOTE

For KWH readings: The first digit on the left of the KWH counter will blank out on the display when rollover at 199999 KWH occurs. The actual value of the first digit can only be viewed through digital communications. Or, reset the KWH counter to zero to avoid confusion.

5.2 Accessing Voltage and Current Phases

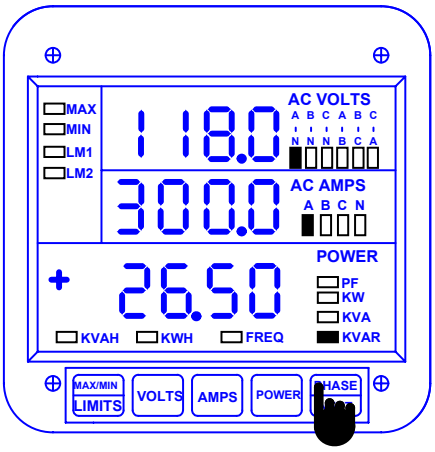
The EPM5300P displays four current measurements (phases A, B, C, and Neutral) and six voltage measurements (phase-to-phase: A-B, B-C, C-A and phase-to-neutral: A-N, B-N, C-N).



Step 1:

a. To select the Amps (or Volts) category, press ***AMPS*** (or ***VOLTS***).

⇨ The display blanks and all annunciators in the section glow, confirming selection.



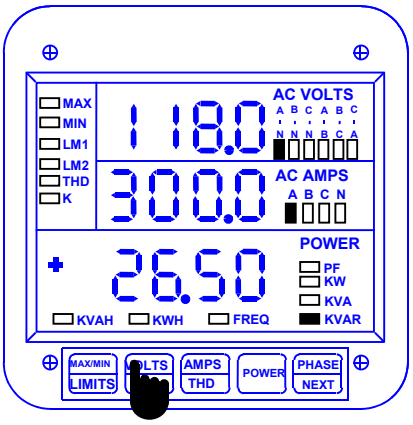
Step 2:

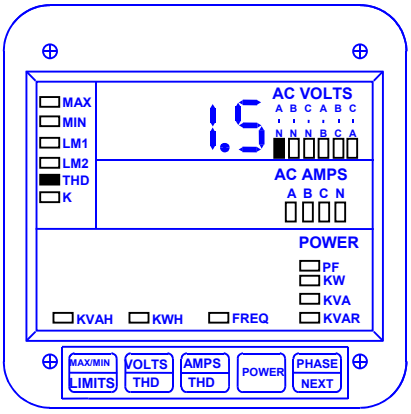
a. Press ***PHASE/NEXT*** for the desired phase.

5.3 Accessing %THD Functions

Harmonic Measurement readings are available on the EPM 5300P meter. The EPM 5300P displays 6 parameters of total harmonic distortion. It measures harmonic waveforms and %THD for voltage phases A-N, B-N and C-N, and current phases A, B and C. Measurement capability reaches the 31st harmonic order. All readings are faceplate accessible.

To access %THD:





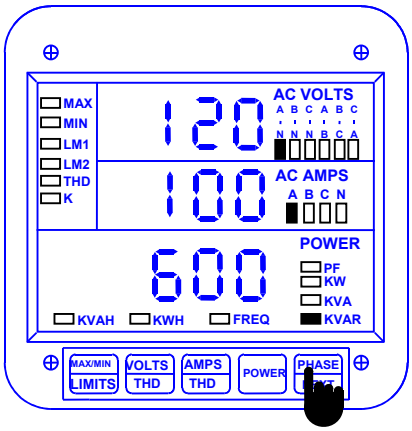
Step 1:

a. To access %THD values for a voltage or current phase press ***VOLTS/THD*** (or ***AMPS/THD***) twice.

⇨ The display blanks and indicates the %THD value momentarily.

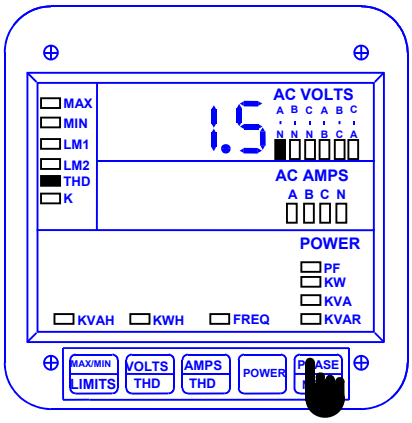
5.4 Viewing Individual Phase Indication for Power Functions

The EPM 5300P normally displays a three-phase indication for PF, KW, KVAR, KVA readings. To view the individual phase A, B and C for those power functions follow the procedure below. This procedure is particularly useful for detecting a current transformer (CT) polarity reversal. A CT polarity reversal will result in a low or negative KW indication, while the KVA will be unaffected.



Step 1:

a. Press ***POWER*** to select power readings. Press ***PHASE/NEXT*** to select a specific power function (PF, KW, KVAR, KVA).



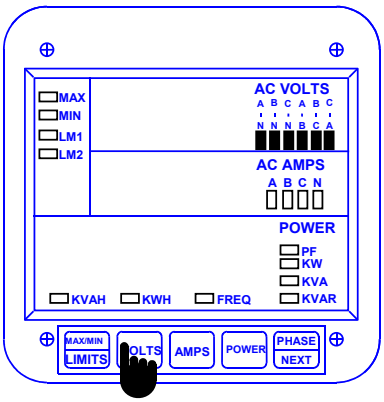
Step 2:

Press and hold the ***POWER*** button to scroll through the instantaneous single-phase power readings.

5.5 Accessing Max/Min Values

Max/min values represent the highest and lowest average demand over a user programmable time period known as the **Integration Interval**. The readings are calculated using a rolling average technique. Each second, a new reading is used to calculate the max/min; the last reading of the interval is dropped off. The highest max during an averaging period is stored until the user resets the max/min. This is similar to amp demand meters. It is commonly referred to as Thermal Demand.

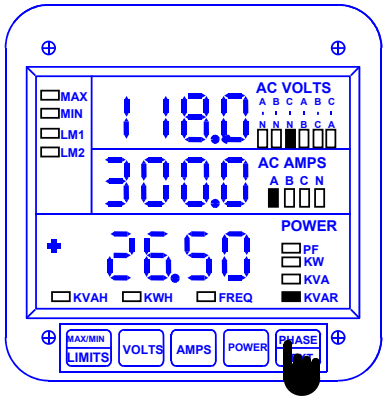
To access a max/min value while displaying a desired measurement, press ***MAX/MIN/LIMITS***—once for the max value; twice for the min. Examples given below are for voltage and current phases. Use the same procedure for all other parameters.



Step 1:

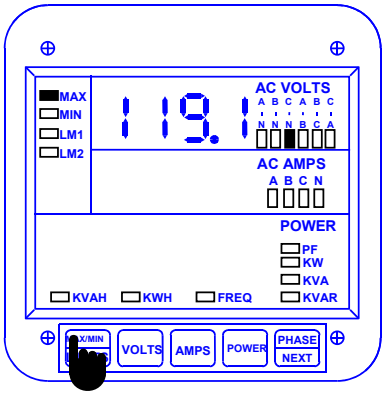
a. To select the Volts category, press ***VOLTS***.

⇨ The display blanks and all annunciators glow, confirming selection.



Step 2:

a. Press ***PHASE/NEXT*** for the desired phase.



Step 3:

a. Press ***MAX/MIN/LIMITS*** once to view the maximum reading for Volts C-N.

⇨ The display blanks and momentarily indicates the max value.

To access KW, KVAR and PF negative measurements indicating leading current, press ***MAX/MIN/LIMITS*** five times for negative max and six times for negative min.

5.6 Resetting Values

Use the reset function if a new value is desired. It is available in two different modes.

1.**UNPROTECTED MODE**: Allows quick and easy resetting of max/min values.

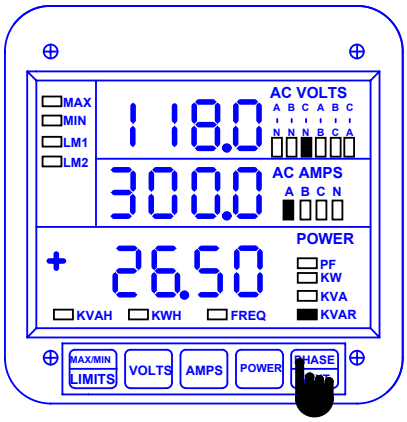
2.**PROTECTED MODE**: Prevents unauthorized resetting the max/min and totaled power functions.

NOTE

Even if the unprotected mode is selected during programming, the KWH and negative KWH are always in protected mode. The following examples are for the max/min.

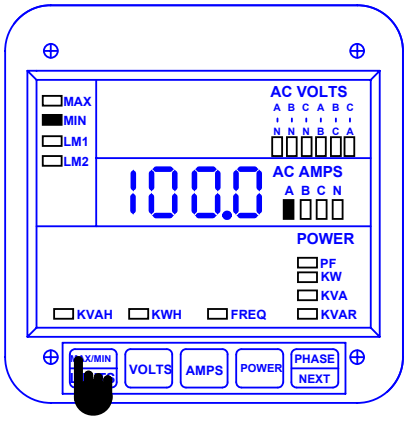
5.6.1 Unprotected Reset

To reset the min of Amps A:



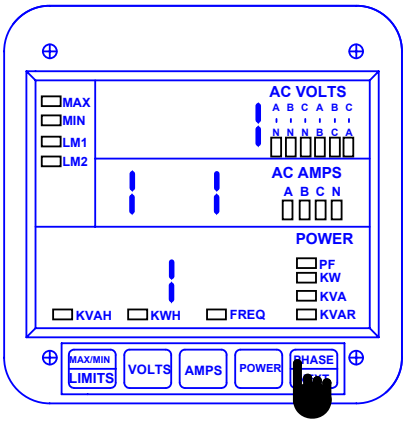
Step 1:

a. If not already in the Amps category press ***AMPS***, then ***PHASE/NEXT*** until desired phase is indicated.



Step 2:

a. Press ***MAX/MIN/LIMITS*** twice to access the min value for Amps A.



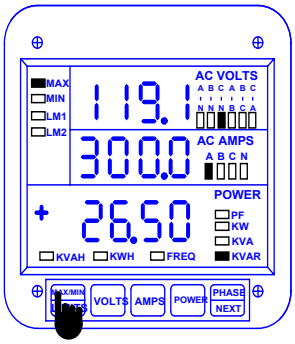
Step 3:

a. While the min value is displayed, press ***PHASE/NEXT*** to reset it.

⇨The display blanks; a checkmark appears confirming reset.

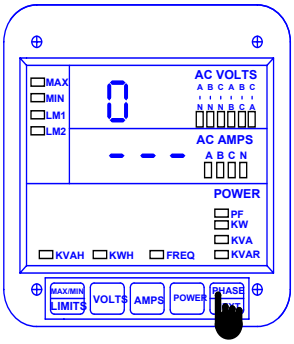
⇨Repeat this procedure for each value you wish to reset.

5.6.2 PROTECTED RESET



Step 1:

a. Press ***MAX/MIN/LIMITS*** once to access max value; twice to access min value.

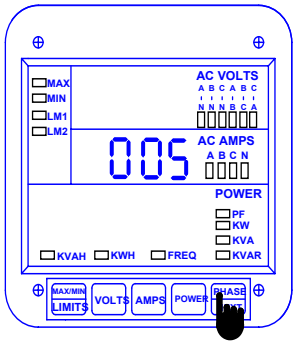


Step 2:

a. While the value is display, press ***PHASE/NEXT*** to commence protected reset.

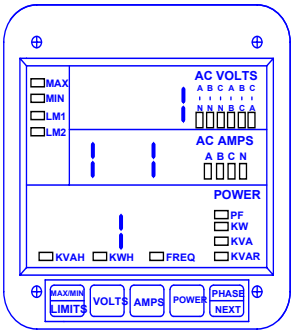
⇨The display blanks, three dashes appear in middle display and digits begin scrolling in upper display.

⇨ The password is ***005***.



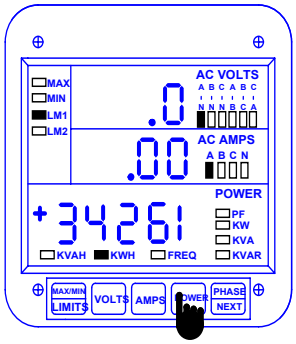
Step 3:

a. Press ***PHASE/NEXT*** each time a password digit appears.



⇨ When the correct password is entered, a checkmark appears, confirming reset.

5.7 Resetting Hour Readings

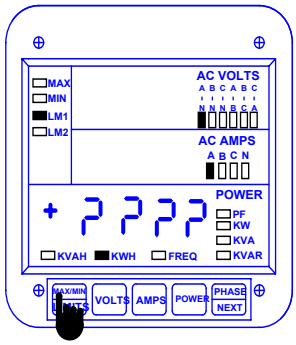


Step 1:

a. Press ***POWER*** once.

b. Press ***PHASE/NEXT*** for the desired hour function.

⇨This example uses KWH function.

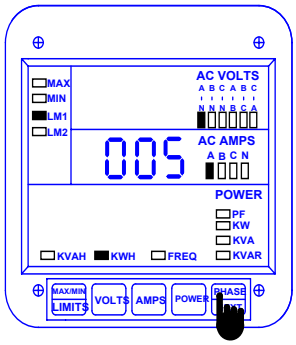


Step 2:

a. Press ***MAX/MIN/LIMITS***

once for positive hour reset three times for negative hour reset.

⇨ Four question marks appear in lower display.

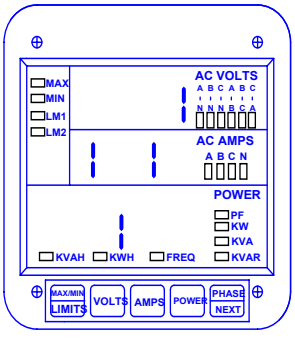


Step 3:

a. While the question marks are displayed, press ***PHASE/NEXT***. A password entry is now required.

⇨The password is ***005***.

b. Press ***PHASE/NEXT*** each time a password digit appears.



⇨ Checkmarks appear, indicating a successful reset.

5.8 Accessing the LM1/LM2 Set Limits

The EPM 5300P has two manual set limits which monitor the instantaneous readings and warn the user of any abnormal conditions. Each limit detects readings either above or below a set level. The EPM 5200P does not have this feature.

SET LIMITS: Point when the relay changes position, if the EPM 5300P is equipped with the Relay Option (Suffix -NL).

If a limit is exceeded, only the annunciator for LM1 and/or LM2 flash.

To view the setup of the LM1/LM2 set limits:

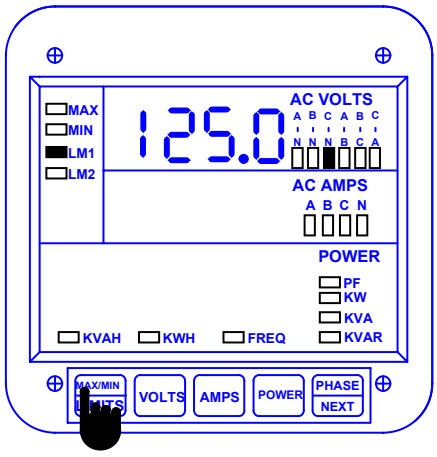
- ▷ Press *MAX/MIN/LIMITS* 2 times. to view the LM1 set limit momentarily.
- ▷ Press *MAX/MIN/LIMITS* 3 times to view the LM2 set limit momentarily.

To locate readings that exceeded Limit 1:

- ▷ Press *MAX/MIN/LIMIT* 3 times
- ▷ Press *PHASE/NEXT*.
  The display blanks, the middle display indicates *L1*, and annunciators for parameters that exceeded Limit 1 illuminate.

To locate readings that exceeded Limit 2:

- ▷ press *MAX/MIN/LIMIT* 4 times
- ▷ press *PHASE/NEXT*.
  The display blanks, the middle display indicates *L2*, and annunciators for parameters that exceeded Limit 2 illuminate.



To access the set limit,

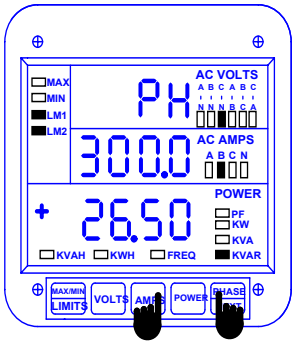
- ▷ press *MAX/MIN/LIMITS*
  - 3 times for LM1
  - 4 times for LM2

5.9 Voltage Phase Reversal and Imbalance

In a three-phase power distribution system, normal phase shift between each line is 120°. If the EPM 5300P detects an abnormality, it displays a message of PH. The EPM 5200P does not have this feature.

VOLTAGE PHASE REVERSAL: If there is an incorrect connection, such as mistaking line A for line B, a PH message appears. The correct sequence is a-b-c.

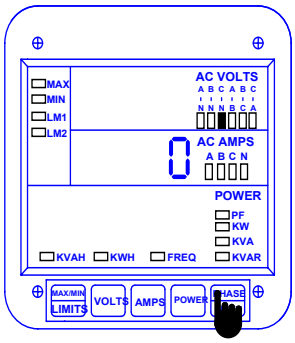
VOLTAGE PHASE IMBALANCE LIMIT: This is detected using the phase imbalance limit in the Programming Mode. The phase imbalance is expressed as a percentage, with 0% indicating a 120° phase shift between each line. A PH message appears if the limit is exceeded.



Step 1:

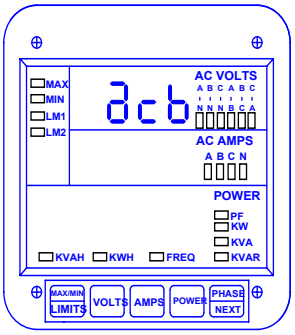
a. Press and hold down ***PHASE/NEXT***. While holding down PHASE/ NEXT, press AMPS to access the display.

⇨(PH indicates both Voltage Phase Reversals and Voltage Phase Imbalances.)

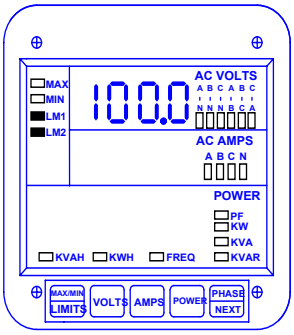


Step 2:

a. Press ***PHASE/NEXT*** to select zero.



⇨ This display indicates a Voltage Phase Reversal.



⇨ This display indicates a Voltage Phase Imbalance.

NOTE

In the event Voltage Phase Reversal and Voltage Phase Imbalance occur simultaneously, the display alternates between the incorrect phase sequence and the exceeded limit percentage. After six seconds the display returns to the normal operating mode.

5.10 Access Modes

The following access commands allow the user to perform specific operations.

ACCESS COMMANDS	OPERATION
1	Print Operating Data
2	Print Programming Data
3	Enter Programming Mode (see Programming Section)
4	Firmware Version/LED Test

NOTE

Print commands 1 and 2 are only available if enabled in the programming mode; they are not recommended when using the multimeter connection RS-485.

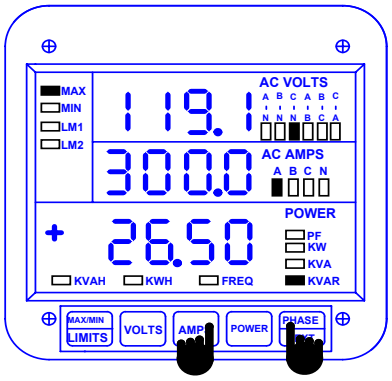
5.11 Print Operating Data

This function sends data to a serial printer, creating a hard copy of the instantaneous and max/min data of all functions and the WH, VAH, and WH counters.

NOTE

This function applies only if a serial printer is connected to the EPM 5300P via an RS-232C Communication Converter.

To print the operating data:

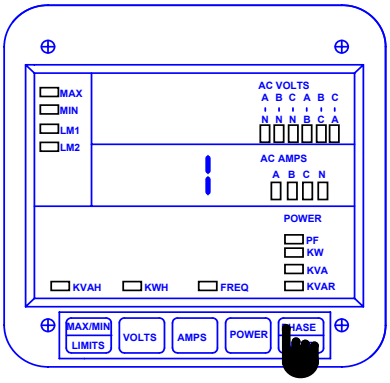


Step 1:

Press and hold ***PHASE/NEXT***.

Press ***AMPS*** until a **0** appears in the middle display.

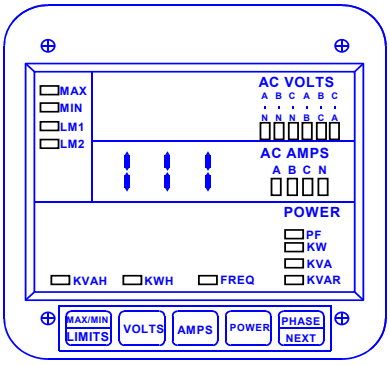
Release both buttons.



Step 2:

a. Press ***AMPS*** until a **1** appears..

b. Press ***PHASE/ NEXT*** to select.

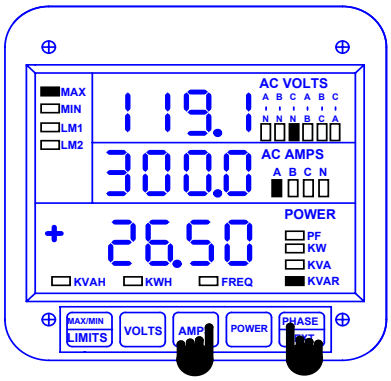


⇨ ***111*** appears, confirming a successful print command.

5.12 Print Programming Data

This function sends the programming data (or the meter setup) to a serial printer for verification and quick reference.

To print the programming data:

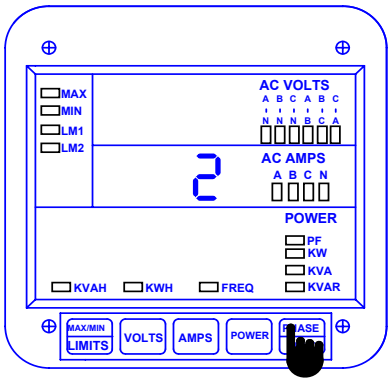


Step 1:

Press and hold ***PHASE/NEXT***.

Press ***AMPS*** until a **0** appears in the middle display.

Release both buttons.

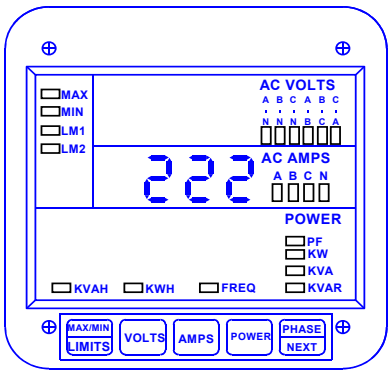


Step 2:

⇨ The display blanks.

a. Press ***AMPS*** until a **2** appears.

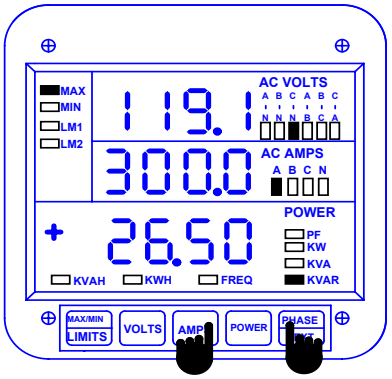
b. Press ***PHASE/NEXT*** to select.



⇨ ***222*** appears, confirming a successful print command.

5.13 Accessing Firmware Version/LED Test

The EPM 5300P accesses the firmware version number of the analog and digital microprocessors. It also performs an LED test to check if the LEDs and annunciators are functioning properly.

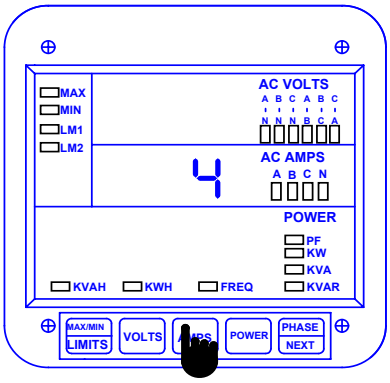


Step 1:

Press and hold ***PHASE/NEXT***.

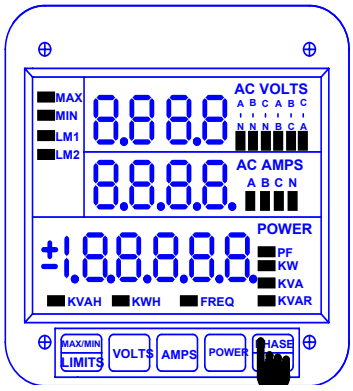
Press ***AMPS*** until a **0** appears in the middle display.

Release both buttons



Step 2:

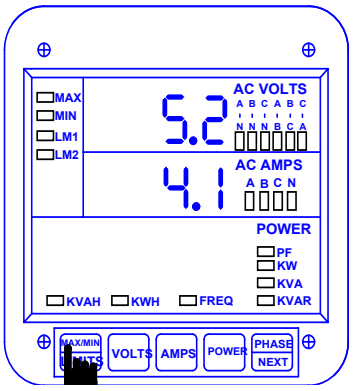
a. Press ***AMPS*** until **4** appears.



Step 3:

a. Press ***PHASE/NEXT*** for the LED test.

⇨ All segments and annunciators glow.



Step 4:

a. Follow Steps 1 and 2, then press ***MAX/MIN/LIMITS*** for the firmware versions.

Firmware versions:

- Upper display—analog processor version
- Middle display—digital processor

EPM 5300 Series Meters

Chapter 6: Programming Overview

6.1 General Procedure

Programming tasks are arranged into nine major GROUPS. Within each GROUP are the specific meter FUNCTIONS. Outlined is the general approach to alter programming mode values.

Enter the Programming Mode.

Select the desired GROUP.

Once the desired GROUP is selected, select a FUNCTION within the GROUP. For GROUP 0, some functions are further divided into PACKS containing four switches referred to as switches A, B, C, D (left to right).

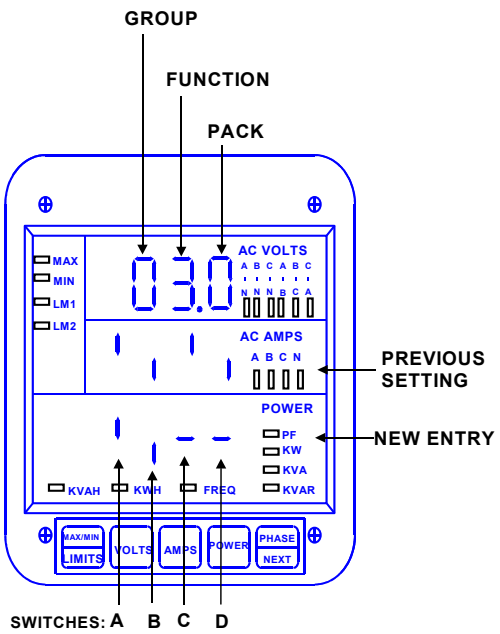
After the FUNCTION selection, proceed with DATA ENTRY of the new value for the desired parameter.

Proceed to program another location and/or exit the programming mode.

NOTE

IMPORTANT: The full exiting procedure must be followed to store any new programming.

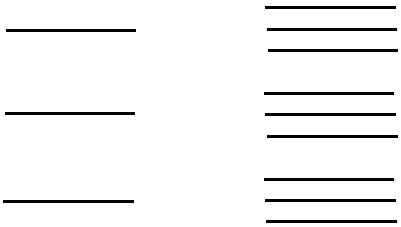
6.2 Switch Packs



GROUPS, Functions, and Switch PACKS

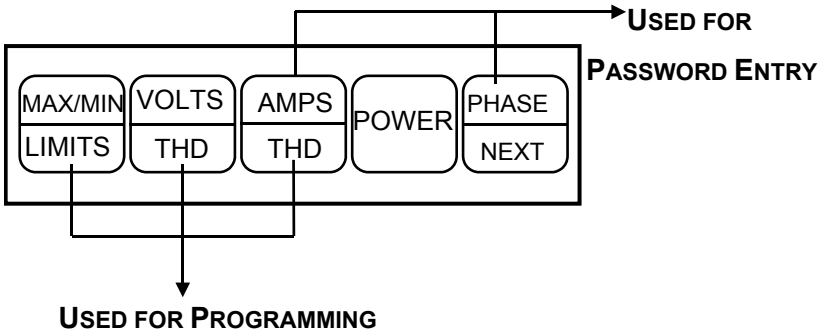
- GROUPS are the main category.
- Functions are sub categories of GROUPS.
- Switch PACKS are sub categories of FUNCTIONS.

Groups → Functions → Packs



6.3 Programming Mode Data Entry

The EPM 5300P and EPM 5200P programming mode utilizes only three out of the five-keypad buttons: the ***MAX/MIN/LIMITS***, ***VOLTS/THD***, and ***AMPS/THD*** buttons.



NOTE

The EPM 5200P uses the same keypad strokes and methods. Although the keypad may look slightly different, the keys match the EPM 5300P exactly. In the interest of brevity, all keystrokes and programming functions are shown using the EPM 5300P keyboard.

Button	Function	Description
MAX/MIN/LIMITS	ADVANCES	Scrolls GROUPS, FUNCTIONS and advances to exit point from FUNCTION and GROUP level.
VOLTS/THD	CHANGES VALUE	Scrolls PACKS, digit counters and changes switch PACK position UP or DOWN.
AMPS/THD	STORES	Activates new data entry and enters or exits from GROUP or FUNCTION level.

6.4 Standard Numeric Data Entry

Programmable FUNCTION values are always four digit numerical fields designed to accept any value between 0000 and 9999 (a blank signifies a zero). When entering the value of a FUNCTION, enter all four digits, leading zeros included. For instance, to enter the number 25, enter 0025.

EPM 5300 Series Meters

Chapter 7: EPM 5200P

7.1 EPM 5200P

The EPM 5200P is similar to the regular EPM 5300P with the following exceptions:

1. The size of the display digits is smaller (0.300" instead of 0.560").
2. The following features are not available:
   - The energy readings: VA/H, VAR/H.
   - The limits: Lim1 and Lim2, and dry contact relay outputs.
   - The harmonics readings: %THD and K-factor.
3. The layout of the keypad is slightly different (although the keys have exactly the same functions).

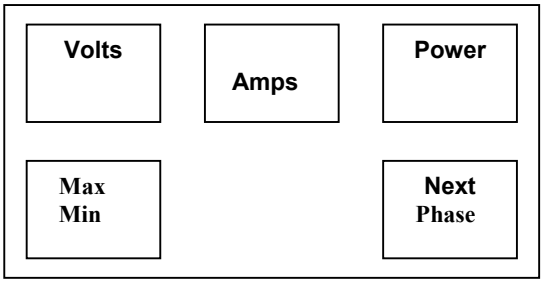


FIGURE 7–1: The Keypad

4. The unit's legend values are jumper-selectable: the user, if necessary, needs to open the cover and choose between V and KV, A and KA, Kilo(k) and Mega (M) for power relays.
5. The annunciators are highlighted one at a time.

NOTE

The Ethernet model, **EPM 5350P**, is covered in detail in Chapter 16 of this manual. See p. 40 for a comparison of the three models covered in this manual.

Table 7–1: EPM 5300P vs EPM 5200P vs EPM 5350P

Feature	5300P	5200P	5350P
Voltage 3-Phase	4	4	4
Voltage Accuracy	0.2%	0.3%	0.2%
Current 3-Phase and Neutral	4	4	4
Current Accuracy	0.2%	0.3%	0.2%
Watts, VARS, VA, PF	4	4	4
Watts Accuracy	0.4%	0.6%	0.4%
Frequency	4	4	4
Watt/HR	4	4	4
VAR/HR (Optional)	4		4
VA/HR	4		4
Harmonics to 31st Order	4		4
Max/Min Demand	4	4	4
Limits	4		4
Relays and Logic	4		4
Pulse Outputs	4	4	4
Digital Communication	4	4	4
Modbus RTU	4	4	
Modbus ASCII	4	4	
DNP Protocol	4	4	
Modbus Plus Capability	4	4	
Analog Outputs	4		
Modbus TCP			4
Ethernet			4

EPM 5300 Series Meters

Chapter 8: Entering Programming Mode

8.1 Checksum Error—Protective Self-Checking Algorithms

This checksum error is a protective self-checking wealth algorithm designed to alert the user when a procedure has not been correctly followed, ensuring that the meter does not display inaccurate readings.

If the control power is interrupted while in Programming Mode or the user does not completely exit, the meter enters a checksum mode. The max LED flashes. Press ***AMPS*** and ***PHASE/NEXT*** simultaneously and the unit recovers. Follow the procedure to enter Programming Mode to check program data. If the data is correct, then exit.

8.2 Password Entry

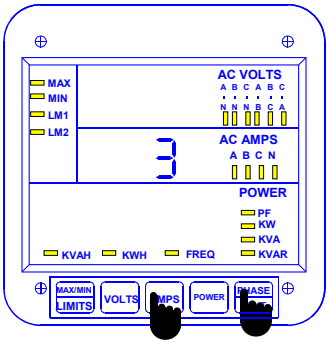
The EPM 5300P and 5200P are password protected. To enter the Programming Mode, key in the following password: ***555***.

The password entry may seem awkward at first. It is designed to be difficult to use initially. This secures unauthorized tampering. After you become familiar with password entry, you will find it quick and easy to accomplish.

NOTE

The meter will not store any programming unless properly exited (see Chapter 14 to Exit).

Entering Programming Mode:



Step 1:

a. Press and hold ***PHASE/NEXT***.

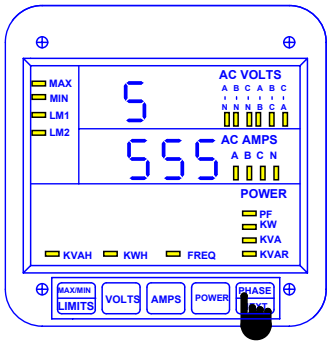
b. While holding ***PHASE/NEXT***, press ***AMPS*** until a number appears in middle display. Then **release** both buttons.

⇨ If ***3*** is not already displayed:

c. Press ***AMPS*** until ***3*** appears.

d. Press ***PHASE/NEXT*** to multiply the ***3*** to ***333***.

⇨ ***333*** flashes momentarily in middle display.



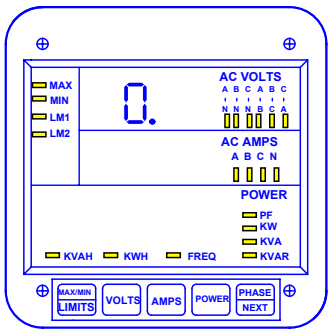
Step 2:

⇨ Digits begin scrolling in upper display.

⌦ The password is **555**.

a. Press ***PHASE/NEXT*** each time the digit **5** appears.

⇨ Selected digits appear in middle display.



⇨ Display blanks and ***PPP*** flashes in upper display, confirming a correctly entered password.

⇨ ***PPP*** is replaced by ***0.*** and the meter is now in Programming Mode, GROUP 0.

⇨ You are now in the Programming Mode. CONGRATULATIONS!

NOTE

AUTO SCROLLING will automatically show all of the readings on the face of the meter except LIMITS. To enter Auto Scrolling mode, follow the above steps except use the numbers 666 as the password. To exit Auto Scrolling mode, use the same procedure as described above.

EPM 5300 Series Meters

Chapter 9: Programming
Group 0 - Global Meter Setup

The Global Meter Setup includes FUNCTIONS 0 through 7 that control configuration and basic operation. FUNCTION 3 System Configuration contains Switch PACKS with various options, including Open Delta installation, communications or DC Output setup. Global Meter Setup is the section in which general features are programmed.

Function Number	Function
0.	Integration Interval
1.	Meter Address for Communication
2.	Baud Rate for Communication
3.	System Configuration (see Table 9-2)
4.	Relay 1 Set-up / Time delay
5.	Relay 2 Set-up / Time delay
6.	KYZ Parameter Selection
7.	Number of Phases
E.	Exit Programming GROUP 0

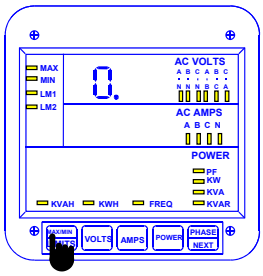
9.1 Group 0, Function 0—The Integration Interval

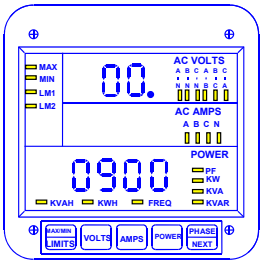
INTEGRATION INTERVAL: Time which all instantaneous readings are averaged to obtain a max and min demand. The Integration Interval is entered in seconds. When entering 15 minutes, enter: 0900 seconds. The default value is 900 seconds.

To change the Integration Interval:

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.





Step 1:

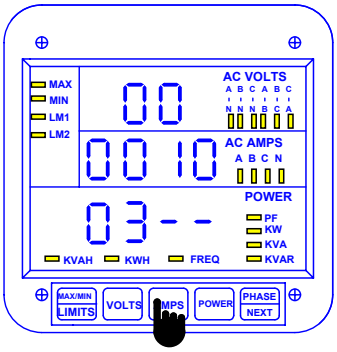
a. Enter Group Level of Programming Mode (see Chp. 8).

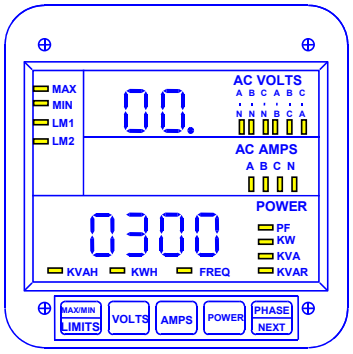
b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears in upper display.

c. Press ***AMPS*** to activate the Group.

⇨ Function ***00.*** appears in upper display. The second ***0*** indicates Function 0

⇨ Lower display indicates current Interval setting.





Step 2:

a. Press ***AMPS*** once to begin Data Entry Sequence.

⇨The previous value shifts to middle display and four dashes appear in lower display.

b. Press ***VOLTS*** for desired number.

c. Press ***AMPS*** to store.

⇨Repeat this procedure until new Integration Interval is entered.

⇨ When complete, middle display blanks and lower display indicates new Integration Interval.

See Chapter 14 to Exit.

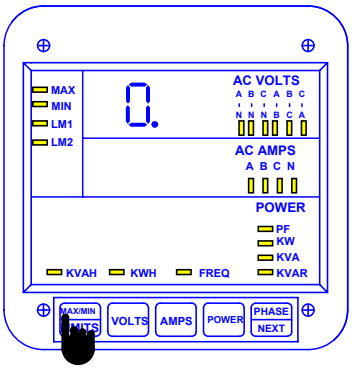
Group 0, Function 1 — The Meter Address

METER ADDRESS: Identifies the meter when communicating with digital communications. When numerous meters are at one site, it is essential that each meter have its own address. Otherwise, all meters speak at the same time and communication is useless.

To change the Meter Address:

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.

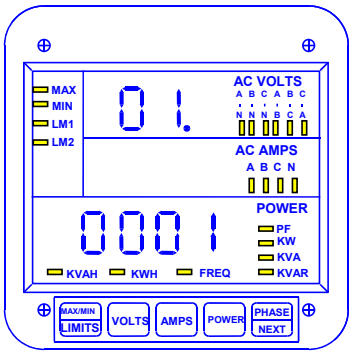


Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears.

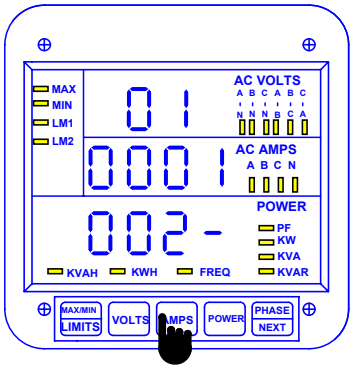
c. Press ***AMPS*** to activate the Group.



Step 2:

a. Press ***MAX/MIN/LIMITS*** until Function ***01.*** appears in upper display.

⇨ Lower display indicates the current Meter Address.



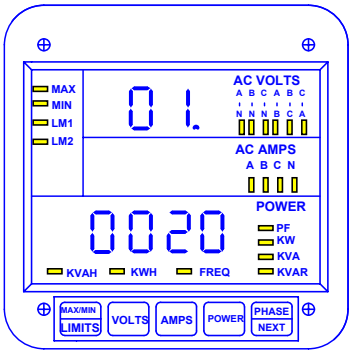
Step 3:

a. Press ***AMPS*** once to begin Data Entry Sequence.

⇨ The previous value shifts to middle display and four dashes appear in lower display.

b. Press ***VOLTS*** for desired number.

c. Press ***AMPS*** to store each digit.



⇨ Repeat this procedure until new Address is entered.

⇨ When complete, middle display blanks and lower display indicates new Address.

See Chapter 14 to Exit.

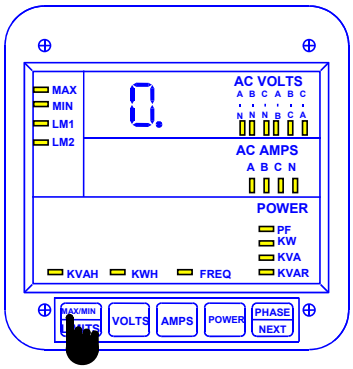
9.2 Group 0, Function *2* — Baud Rate

BAUD RATE: Speed at which data is transmitted between meter and remote computer or serial printer. The rate programmed into the meter must match the rate used by the remote device. Valid Baud Rates are 1200, 2400, 4800 and 9600.

To change the Baud Rate:

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.

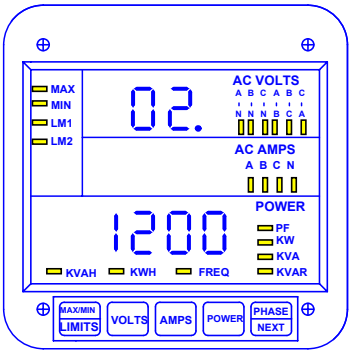


Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears.

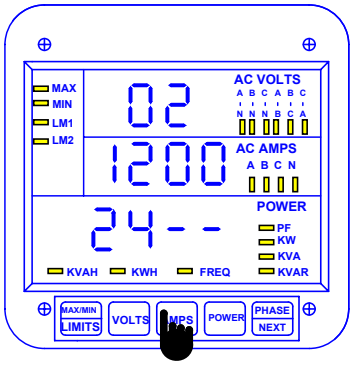
c. Press ***AMPS*** to activate the Group.



Step 2:

a. Press ***MAX/MIN/LIMITS*** until Function ***02.*** appears in upper display.

⇨ Lower display indicates current Baud Rate.



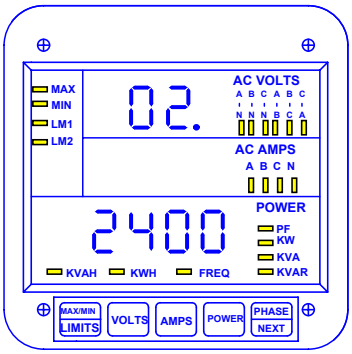
Step 3:

a. Press ***AMPS*** to begin Data Entry Sequence.

⇨ The previous value shifts to middle display and four dashes appear in lower display.

b. Press ***VOLTS*** for desired number.

c. Press ***AMPS*** to store each digit.



⇨ Repeat this procedure until new Communication Baud Rate is entered.

⇨ When complete, middle display blanks and lower display indicates new Baud Rate.

See Chapter 14 to Exit.

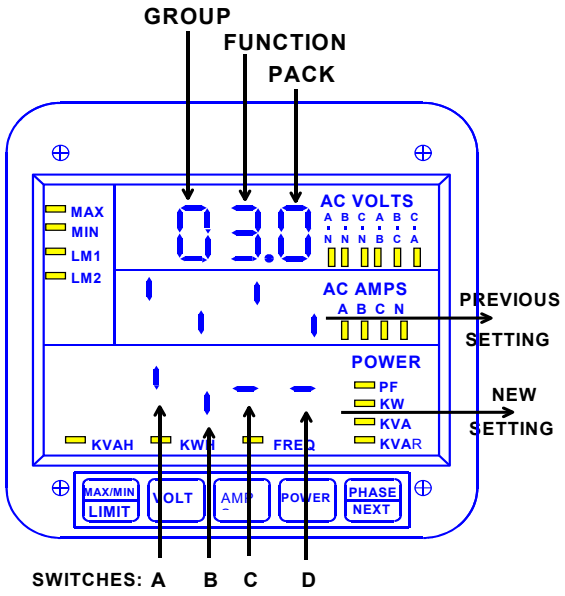
9.3 Group 0, Function 3 — System Configuration

The System Configuration sets the EPM 5300P's basic operational parameters. This Function utilizes Switch PACKS.

FUNCTION *3* contains four different Switch PACKS: *0–3*. Each PACK contains four individual UP/DOWN segments.

- Toggling the segment between UP and DOWN, toggles the switch ON or OFF, or chooses between two options.
- The meter displays one Switch PACK at a time.

⇨Press ***VOLTS*** to scroll from PACK to PACK.



Pack	Switch	Feature	Segment Position
0	A	Reserved	—
	b	Reserved	—
	c	Reserved	—
	d	Phase Reversal Limit Detection	UP: Enable DOWN: Disable

1	a	Non-significant will blank leading zero	UP: Enable DOWN: Disable
	b	Reset Protection (see Part I: Installation and Operation)	UP: Enable DOWN: Disable
	c	Phase Reversal Rotation Selection	UP: CBA Rotation DOWN: ABC Rotation
	d	Open Delta Installation (see Part I: Installation and Operation)	UP: Enable DOWN: Disable
2	a	Limit/Relay Control	UP: Average DOWN: Instantaneous
	b	Power Factor Polarity Indicates + (voltage referenced) or - (current referenced)	UP: -PF DOWN: +PF
	c, d	For EI-BUS protocol: Switch C is DOWN, Switch D is DOWN. For MODBUS protocol, ASCII framing: Switch C is UP, Switch D is UP. For MODBUS protocol, RTU framing: Switch C is DOWN Switch D is UP. For DNP 3.0 protocol: Switch C is UP, Switch D is DOWN.	
3	a	Trip Relay Computer Control 1 (Relay Control 1 and 2 apply only if Relay Option -NL was ordered.)	UP: Enable DOWN: Disable
	b	Trip Relay Computer Control 2 (Relay Control 1 and 2 apply only if Relay Option -NL was ordered.)	UP: Enable DOWN: Disable
	c	RS-232 or RS-485 Communications or Print	UP: Enable Communications DOWN: Enable DC Output
	d	DC Output (To operate DC Output, disable PACK 3, Switch C) or Print Operating and Programming Data (To print, set PACK 3 Switches C and D to UP position.)	UP: Enable DC Output or Print Communication DOWN: Disable DC Output and Print

9.3.1 Open Delta System Installation Programming

A special switch is used to indicate that the electrical system being monitored is a Three-phase WYE or Three-Wire Open Delta System using the connection installation (see Chapter 3). The switch is located in GROUP 0, FUNCTION 3, Pack 1, Switch D.

This switch should be set to UP only if the electrical system is a Three-Wire Delta or Open Delta, using 2 PTs. Otherwise, the switch should be set to DOWN. Failure to select this switch results in Phase-to-Neutral readings, as well as incorrect power readings, with the 2PT connection.

Special Open Delta Connection Installation should be followed in the Installation and Operation section (Chapter 3).

9.3.2 Switching Communication Protocols, EI-BUS, MODBUS RTU/ASCII, DNP 3.0

- For EI-BUS protocol: PACK *2*, Switch C is DOWN, Switch D is DOWN.
- For MODBUS protocol, ASCII framing: PACK *2*, Switch C is UP, Switch D is UP.
- For MODBUS protocol, RTU framing: PACK *2*, Switch C is DOWN Switch D is UP.
- For DNP 3.0 protocol: PACK 2, Switch C is UP, Switch D is DOWN.

When programming for MODBUS protocol configuration of LIPA (Long Island Power Authority) mapping options may be performed through communication.

9.4 Modbus Plus Capability

When using the MPI Modbus Plus adapter, the meter values should be set to speak to Modbus RTU with a meter address of 0001 and a baud rate of 9600 baud. The Modbus Plus address is programmed into the MP1 Modbus Plus adapter directly.

9.4.1 Printing Option

To print, access Mode 1 and Mode 2 (see Part I: Installation and Operation). Printing serial options should be disabled when using a multimeter communications connection RS485.

DISABLING PREVENTS:

1. Printing through the keypad.
2. Corrupting data at a computer terminal while multiple meters poll.
3. Corrupting printing commands through communications.

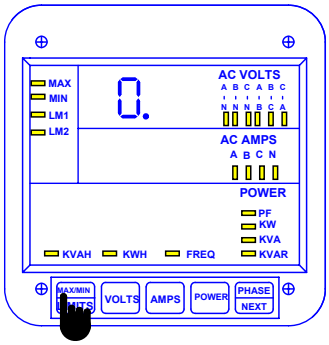
This option connects a serial printer to the RS232 port and prints the data. Disable this feature when the meter is not using an RS232 port (i.e., when RS485 or DC outputs are being used).

9.5 Group 0, Function 3—Programming Procedure

To change the System Configuration Switch Settings:

NOTE

Press **MAX/MIN/LIMITS**, at any time, to cancel before storing the last digit or switch.

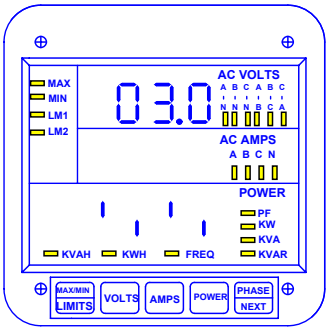


Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears in upper display.

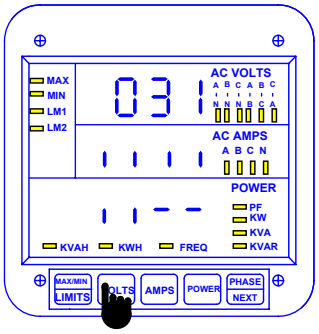
c. Press ***AMPS*** to activate the Group.



Step 2:

a. Press ***MAX/MIN/LIMITS*** until Function ***03.0*** appears in upper display.

⇨ Lower display indicates current PACK 0 Switch Settings.



Step 3:

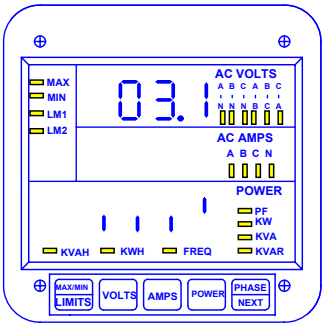
a. Press **VOLTS** until desired PACK appears.

b. Press **AMPS** to begin Data Entry Sequence.

⇨ The previous Switch settings shift to middle display and four dashes appear in lower display.

c. Press **VOLTS** to toggle the segments up or down for desired setting.

d. Press **AMPS** to store each setting.



⇨ Repeat procedure until new Switch Setting is entered.

⇨ The middle display blanks and new Switch Settings are indicated on lower display.

(This example shows enabling of Open Delta Installation switch).

See Chapter 14 to Exit.

9.6 Relay Mode

Relays are not available for the EPM 5200P.

Switch	Description	Segment Position
A	Reversal Imbalance Control	UP⇨Enable DOWN⇨Disable
B	AND/OR Logic	UP⇨AND DOWN⇨OR
C & D	Relay Control	see Table 8-4

The Switch PACKS in FUNCTIONS 4 and 5 of programming GROUP 0 control the relay position. Setting the switches in different combinations allows the user to specify the conditions in which the relay will be "SET" or "RESET." The following table indicates possible configurations.

Switch C	Switch D	Description
UP	UP	**FAIL-SAFE MODE**—The normal or non-event condition is set. RESET relay on either out of limit condition. Relay acts as a protective switch if power is interrupted. This alerts the user if the meter or the meter power is out.
UP	DOWN	N/A (Reserved for future features).
DOWN	UP	N/A (Reserved for future features).
DOWN	DOWN	**RESET MODE**—The normal or non-event condition is reset. SET relay on either out of limit condition.

DEFINITIONS:

RESET: There is a short between "COM" and "N.C." (Normally closed)

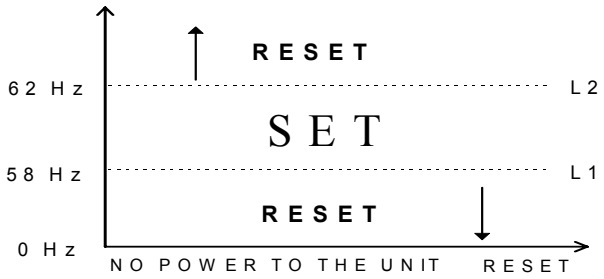
SET: There is a short between "COM" and "N.O." (Normally open)

(See Part I: Installation and Operation.)

EXAMPLE 1: Fail-safe mode normally set—non-event condition is set relay

Relay 1 will be "SET" if the instantaneous reading for frequency is between 58 Hz and 62 Hz. When all other conditions exist, the relay will "RESET."

Under this setup the relay acts as a protective switch.



Programming Steps:

- ▷ **Enter in GROUP 0, FUNCTION 4, PACK 'P', Segment C and D: UP, UP.**
- ▷ **Enter in GROUP 5, FUNCTION 4, LIMIT 1, Segments B, C, and D: DOWN, UP, DOWN. Value: 58.00.**
- ▷ **Enter in GROUP 5, FUNCTION 4, LIMIT 2, Segments B, C, and D: UP, UP, DOWN. Value: 62.00.**

EXAMPLE 2: Normally reset—non-event condition is reset relay

Relay 1 will be "SET" if the instantaneous reading for amps is below 4.00 or above 5.00 amps. Under all other conditions the relay will be "RESET".

NOTE

Under this setup the relay will NOT act as a protective switch.

Programming Steps:

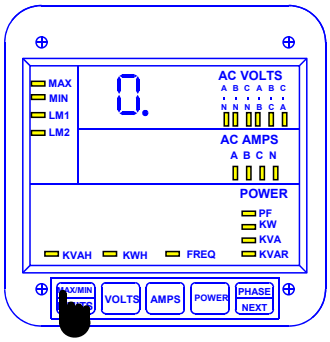
- ▷ **Enter in GROUP 0, FUNCTION 4, PACK 'p', Segments C and D: DOWN, DOWN**
- ▷ **Enter in GROUP 4, FUNCTION 2, LIMIT 1, Segments: B, C, and D: UP, UP, DOWN. Value: 5.00**
- ▷ **Enter in GROUP 4, FUNCTION 2, LIMIT 2, Segments: DOWN, UP, DOWN. Value: 4.00**

Group 0—Function Number	Description
04.P	Controls Relay 1
05.P	Controls Relay 2 (and 3 if NL4)

To change the Relay Mode to either Fail-safe or Reset:

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.

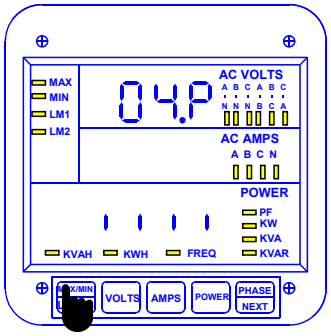


Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears in upper display.

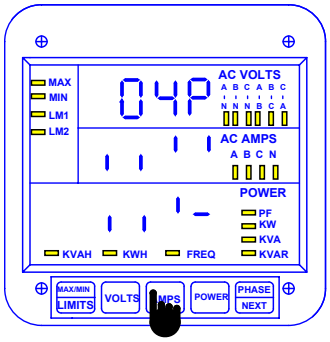
c. Press ***AMPS*** to activate the Group.



Step 2:

Press ***MAX/MIN/LIMITS*** until ***04.P*** (for Relay 1) or ***05.P*** (for Relay 2) appears in upper display.

⇨ Lower display indicates current setting.



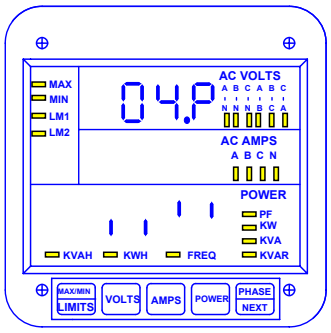
Step 3:

a. Press ***AMPS*** to begin Data Entry Sequence.

⇨ The previous setting shifts to middle display and four dashes appear in lower display.

b. Press ***VOLTS*** for desired switch position.

c. Press ***AMPS*** to store each setting.



⇨ Repeat this procedure until new switch setting is entered.

⇨ When complete, middle display blanks and lower display indicates the programming.

See Chapter 14 to Exit.

9.7 Group 0, Functions 4–5—Time Delay for Relays 1 & 2 (Option – NL)

GROUP 0, FUNCTIONS 4–5 sets the time delay for Relays 1 and 2 between 0 and 255 seconds. This allows conditions (example below) to exist for a user-specified time period before the relay or alarm activates. If a time greater than 255 seconds is entered, the meter defaults to the maximum value of 255 seconds.

Example: If Relay 1 is set for 300 amps and the amps increase to 301, the Relay trips only after a programmed delay period. If the meter then measures 299 Amps, the Relay returns to its original position, after the programmed delay.

Relay 1: Located in 04.0 & 04.1.

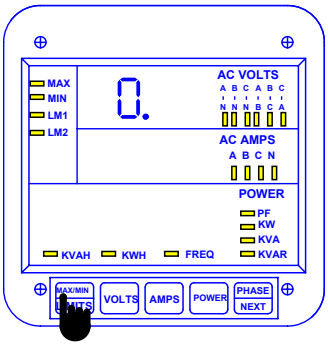
Relay 2: Located in 05.0 & 05.1.

(Procedures for both relays are the same).

Group and Function Number	Description
04.0	Relay 1: On to Off Delay Time
04.1	Relay 1: Off to On Delay Time
05.0	Relay 2: On to Off Delay Time
05.1	Relay 2: Off to On Delay Time

To change Time Delays:

Press **MAX/MIN/LIMITS** at any time, to cancel before storing the last digit or Switch.



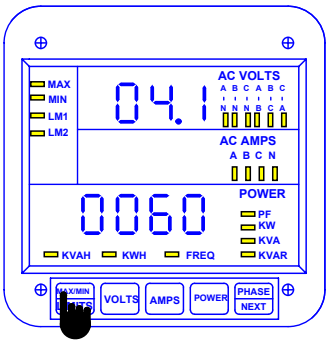
Step 1:

a. Enter Group Level of Programming Mode

(see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears in upper display.

c. Press ***AMPS*** to activate the Group.



Step 2:

To program Relay 1:

a. Press ***MAX/MIN/LIMITS*** until Function ***04.P*** appears in upper display.

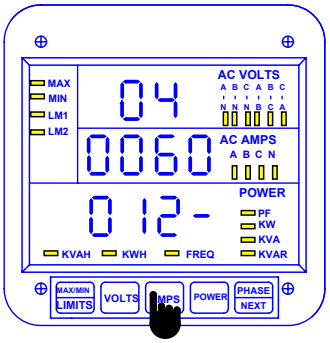
To program Relay 2 and 3:

a. Press ***MAX/MIN/LIMITS*** until Function ***05.P*** appears.

b. Press ***VOLTS*** *once* to display **04.0** (On to Off delay time).

c. Press ***VOLTS*** *twice* to display **04.1** (Off to On delay time).

⇨ Lower display indicates current Time Delays.



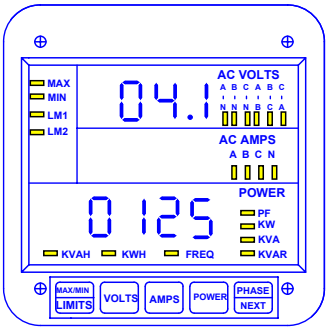
Step 3:

a. Press ***AMPS*** to begin Data Entry Sequence.

⇨ The previous value shifts to middle display and four dashes appear in lower display.

b. Press ***VOLTS*** until number appears.

c. Press ***AMPS*** to store each number.



⇨ Repeat this procedure until new Time Delay is entered.

⇨ When complete, middle display blanks and lower display indicate the new Time Delay.

See Chapter 14 to Exit.

9.8 Group 0, Function 6—KYZ Parameter Selection

NOTE

FUNCTION 6 applies only if Option -NL or -NL2 was ordered.

OPTION -NL: This option gives the meter 2 Relays and one KYZ pulse. The KYZ pulse can be programmed to the below features.

Select a single parameter from **Table 9-5** according to the EPM 5300P model being programmed.

OPTION -NL2: This option offers 3 distinct KYZ pulses instead of Relays.

Only three separate parameters may be selected: FUNCTION 6.0 (KYZ Port 0), FUNCTION 6.1 (KYZ Port 1), and FUNCTION 6.2 (KYZ Port 2). The available parameters vary according to the EPM 5300P model being programmed. For exact port positions see Installation Sections.

Table 9–1: KYZ Parameters

Parameter	Description
0	Disable KYZ
1	Positive Watt Hour KYZ
2	VA Hour KYZ
3	Negative Watt Hour KYZ
4	Positive VAR Hour KYZ
5	Negative VAR Hour KYZ

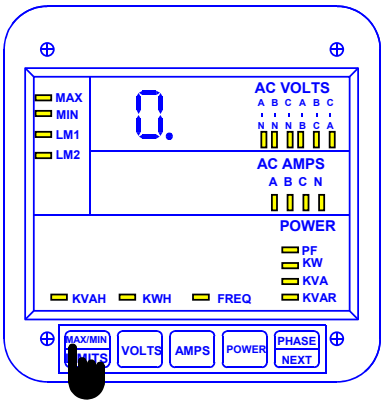
APPLICABLE SELECTIONS: 5300P - +WH, -WH, VAH

5300P - +WH, -WH, +VARH, -VARH

To perform the KYZ Parameter Selection:

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.

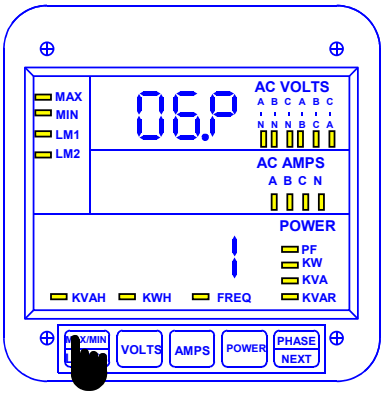


Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears in upper display.

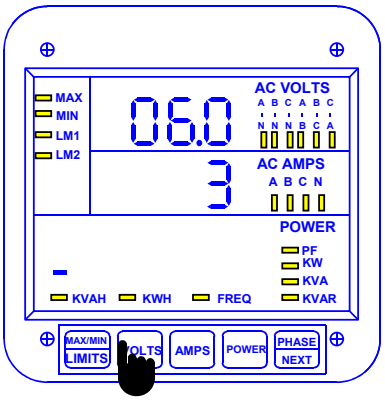
c. Press ***AMPS*** to activate the Group.



Step 2:

a. Press ***MAX/MIN/LIMITS*** until ***06.P*** appears in upper display.

(Standard Selection is 1).

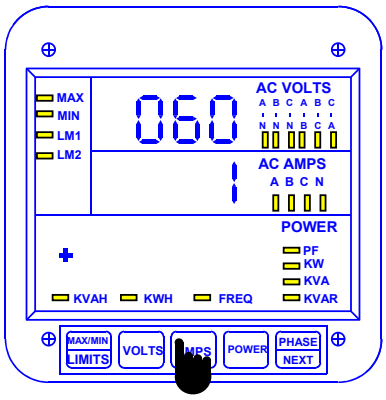


Step 3:

a. Press ***VOLTS*** once and ***06.0*** appears in upper display.

⇨ Middle display indicates preset value.

⇨ Lower display indicates polarity of selected parameter and an annunciator indicates the selected parameter.



Step 4:

a. Press ***AMPS*** once to select a different parameter.

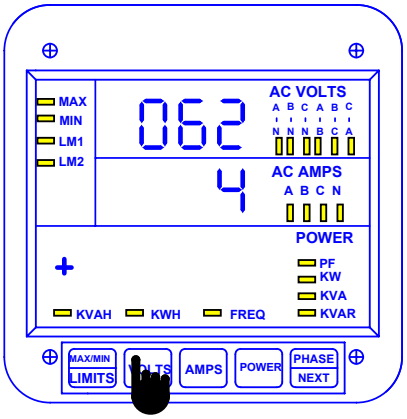
b. Press ***MAX/MIN/LIMITS*** to increase the parameter number

—or—

c. Press ***VOLTS*** to decrease (until desired parameter appears).

d. Press ***AMPS*** to store.

⇨ A decimal appears in upper level. (Models with -NL Option, FUNCTION *6* is complete).



Applies to -NL2 Option only:

Step 5:

a. Press ***VOLTS*** to proceed to another port (06.1 or 06.2).

⇨ Repeat this procedure to change parameters.

See Chapter 14 to Exit.

Table 9–2: KYZ Pulse Value

Selection in 06P	KYZ PULSE VALUE per Watt HOUR FSW=9999.	KYZ PULSE VALUE per Watt HOUR FSW=999.9	KYZ PULSE VALUE per Watt HOUR FSW=99.99	KYZ PULSE VALUE per Watt HOUR FSW=9.999
Multiply by 1	1.0 unit WH	0.1 unit WH	0.01 unit WH	0.001 unit WH
Multiply by 2	0.5 unit WH❷	0.05 unit WH❶	0.005 unit WH	0.0005 unit WH
Multiply by 10	0.1 unit WH	0.01 unit WH	0.001 unit WH	0.0001 unit WH
Multiply by 20	0.05 unit WH	0.005 unit WH	0.0005 unit WH➥	0.00005 unit WH❸
Divide by 1	1.0 unit WH	0.1 unit WH	0.01 unit WH	0.001 unit WH
Divide by 2	2.0 unit WH	0.2 unit WH	0.02 unit WH	0.002 unit WH
Divide by 10	10.0 unit WH❨	1.0 unit WH	0.1 unit WH	0.01 unit WH
Divide by 20	20.0 unit WH	2.0 unit WH	0.2 unit WH③	0.02 unit WH❨

NOTE

The unit WH refers to the counter value on the meter, where the unit equals Kilo or Mega user-defined.

The FSW number is used only for decimal point placement (see Chapter 10).

9.8.1 How to Use KYZ Pulse Value Table for Multiplication:

SITUATION 1: FSW=9999.

Selection is Multiply by 2

This means that every .5 unit WH =1 pulse.

Unit=Kilo (see Group 1, Function 2)

Result: For every 1 KWH increment on the counter, the meter will output 2 pulses.

SITUATION 2: FSW=999.9

Selection is Multiply by 2

This means that every .05 unit WH=1 pulse.

Unit=Kilo (see Group 1, Function 2)

Result: For every 1 KWH increment on the counter, the meter will output 20 pulses.

SITUATION 3: FSW=99.99

Selection is Multiply by 20

This means that every .0005 unit WH=1 pulse.

Unit=Kilo (see Group 1, Function 2)

Result: For every 1 KWH increment on the counter, the meter will output 2,000 pulses.

SITUATION 4: FSW=9.999

Selection is Multiply by 20

Unit=Kilo (see Group 1, Function 2)

This means that every .00005 WH=1 pulse.

Result: For every 1 KWH increment on the counter, the meter will output 20,000 pulses.

9.8.2 How to Use KYZ Pulse Value Table for Division:

SITUATION 1: FSW=9999.

Selection is Divide by 10

This means that every 10 unit WH=1 pulse.

Unit=Kilo (see Group 1, Function 2)

Result: For every 10 KWH increment on the counter, the meter will output 1 pulse.

SITUATION 2: FSW=999.9

Selection is Divide by 10

This means that every 1 unit WH=1 pulse.

Unit=Kilo (see Group 1, Function 2)

Result: For every 1 KWH increment on the counter, the meter will output 1 pulse.

SITUATION 3: FSW=99.99

Selection is Divide by 20

This means that every .2 unit WH=1 pulse.

Unit=Kilo (see Group 1, Function 2)

Result: For every 1 KWH increment on the counter, the meter will output 5 pulses.

SITUATION 4: FSW=9.999

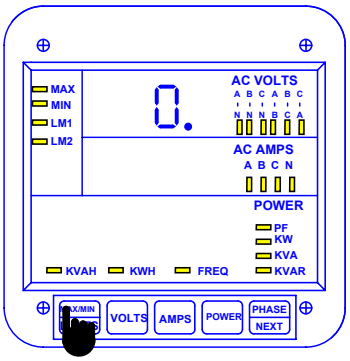
Selection is Divide by 20

Unit=Kilo (see Group 1, Function 2)

This means that every .02 WH=1 pulse.

Result: For every 1 KWH increment on the counter, the meter will output 50 pulses.

To change the KYZ pulse value:

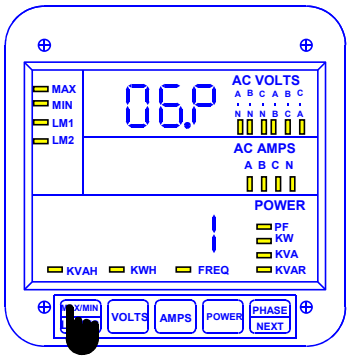


Step 1:

a. Enter Group Level of Programming Mode, (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***0.*** appears in upper display.

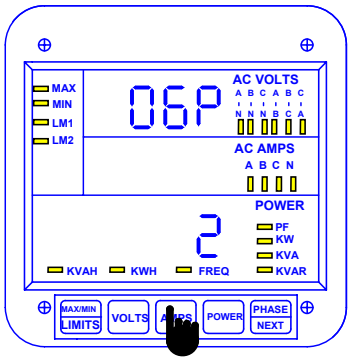
c. Press ***AMPS*** to activate the Group.



Step 2:

a. Press ***MAX/MIN/LIMITS*** until ***06.P*** appears in upper display.

⇨ The lower display indicates multiplication or division factor.



Step 3:

a. Press ***AMPS*** to change current setting.

⇨ The decimal point next to the 6 disappears.

b. Press ***MAX/MIN/LIMITS*** to advance selections. **-or-**

c. Press ***VOLTS*** to reverse.

(Until desired factor appears).

⇨ *Division is indicated by div appearing in the middle display. When middle display is blank, it indicates multiplication.*

d. Press ***AMPS*** to store.

9.9 Group 0, Function 7—Number of Phases

NOTE

ENTER **1** FOR SINGLE PHASE/SINGLE WIRE.

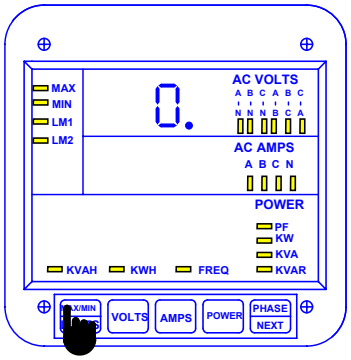
Enter **2** for single phase/two wire.

Enter **3** for three phase/three or four wire.

*Standard factory set-up is three-phase FOUR-WIRE

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.

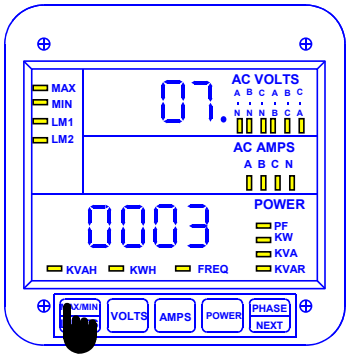


Step 1:

a. Enter Group Level of Programming Mode. (Chapter 8)

b. Press ***MAX/MIN/LIMITS*** if ***0.*** does not appear.

c. Press ***AMPS*** to activate the Group.

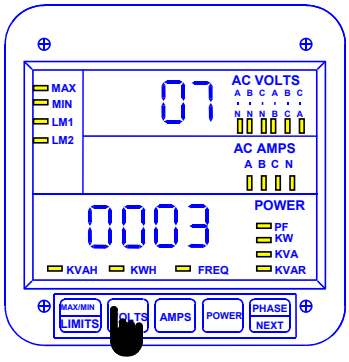


Step 2:

⇨ ***00.*** appears in upper display.

a. Press ***MAX/MIN/LIMITS*** until ***07*** appears in upper display.

b. Press ***AMPS*** to activate the Group.



Step 3:

a. Press ***VOLTS*** to select numbers 1, 2 or 3.

b. Press ***AMPS*** to store. See Chapter 14 to Exit.

EPM 5300 Series Meters

Chapter 10: Programming Group 1 – Voltage, Amp And Watt Scale Settings

NOTE

The EPM 5300P and 5200P full scales will already be programmed if the order specified current and voltage transformer ratios. The meter label indicates any full scale setup.

Programming Group 1 contains voltage, amperage and full scale power selection, along with scale factor selection and decimal point placement.

The user can re-scale without removing the EPM 5300P for calibration. The 5300P has been calibrated at standard levels in GROUP 2. Mathematically convert any full scale ratios to those calibrated levels. If a different current or voltage transformer is used, program the primary value of its ratio. If necessary, convert the ratio to a secondary value of five amps standard current (1 amp is a special order) and 120V or 75V nominal voltage (options L only).

Formulas:

$$\frac{\text{Primary}}{\text{Secondary}} \; x \; 120V \; \frac{\text{Primary}}{\text{Secondary}} \; \text{x} \; 75\text{V} \; \frac{\text{Primary}}{\text{Secondary}} \; \text{x} \; 5\text{A}$$

It may be necessary to convert the full scale to a larger unit. There is a resolution limitation for all full scales of 2000. If a display reading exceeds 2000, it may be unstable and subject to zeroing problems.

Example: The full scale for a CT ratio of 3000/5 should be 03.00 kA.

When changing a PT or CT full scale, calculate the new watts full scale and make any necessary changes. The watts full scale will not auto range.

10.1 Group 1, Function 0

- FULL SCALE VOLTAGE SETTINGS, SCALE & DECIMAL POINT PLACEMENT -

Table 10–1: Group 1 Programming Format

Group and Function Number	Function
10.	Full Scale Selection for Volts
11.	Full Scale Selection for Amps
12.	Full Scale Selection for Watts
1E.	Exit Programming GROUP 1

NOTE

Tables 10-2 and **10-3** contain Full Scale Settings for typical voltages and currents (PT and CT arrangements).

Table 10–2: TYPICAL Full Scale Settings for Volts

Secondary PT Values	PT Ratio	Full Scale
75 V (Suffix 75) L-N MAX	120:1	9.00 KV
120/208 V	1:1 (Direct)	120.0
120/208 V	4:1	0480 V
120/208 V	120:1	014.4 KV
277/480 V (Suffix G)	1:1 (Direct)	0300 V
120/208V	600:1	072.0 KV
120/208	1150:1	138.0 KV

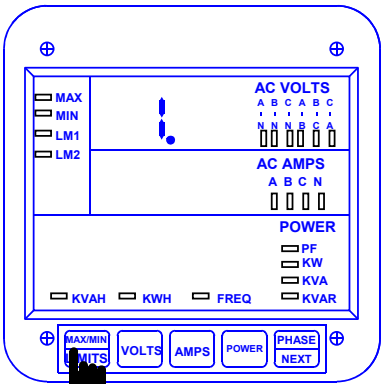
If PT is connected line to line, the full scale can be 14.40 KV. Full scale is **300** V L-N, not 277, because the factory calibration is 300 V. Be sure the table is based on a meter regulation of 2000 A/D counts. Thus, for best accuracy, all settings should be placed within that range.

10.1.1 Voltage Full Scale:

To change the Full Scale Settings:

NOTE

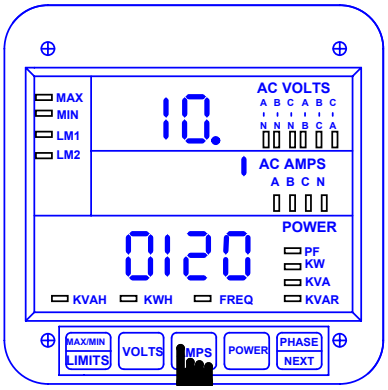
Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.



Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***1.*** appears in upper display.



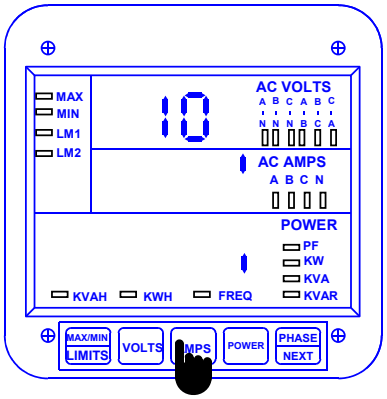
Step 2:

a. Press ***AMPS*** to activate GROUP 1.

⇨ ***10.*** appears in upper display.

⇨ Middle display indicates Scale Factor Setting.

⇨ Lower display indicates Full Scale for voltage.



Enering the Scale Factor:

Step 3:

a. Press ***AMPS*** to begin Data Entry Sequence.

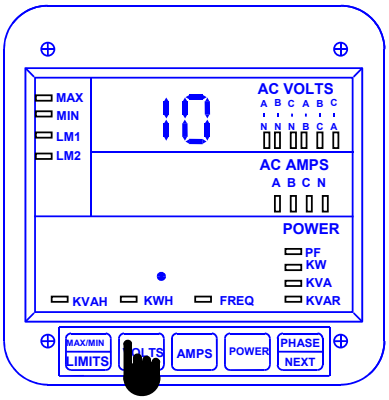
⇨ Lower display is replaced with a single dash.

b. Press ***VOLTS*** to move the segment UP or DOWN to set Scale Factor.

⇨ UP signifies - *Kilovolts*

⇨ DOWN signifies - *Volts*

c. Press ***AMPS*** to store.

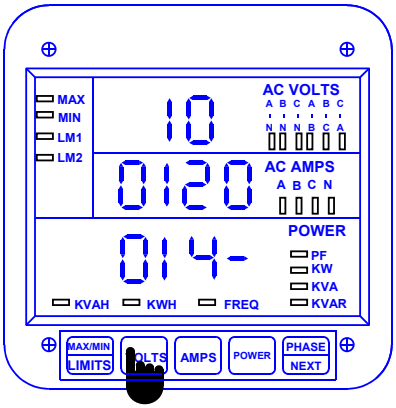


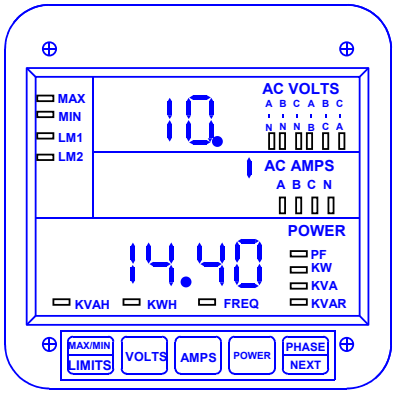
Decimal Point Selection:

Step 4:

a. Press ***VOLTS*** to move decimal point.

b. Press ***AMPS*** to store.





Step 5:

⇨ Middle display indicates present Full Scale for volts.

⇨ Four dashes appear in lower display.

⇨ Enter the four digit full scale.

a. Press ***VOLTS*** to increase the digit number.

b. Press ***AMPS*** to store each digit.

⇨ Repeat this procedure until desired value is entered.

⇨ Lower display indicates new Full Scale Setting.

⇨ Middle display indicates Scale Factor.

⇨ Group and Function Number (including decimal point) appear in upper display.

See Chapter 14 to exit.

10.2 Group 1, Function 1

- AMPERAGE FULL SCALE -

Table 10–3: Full Scale Settings for Amps

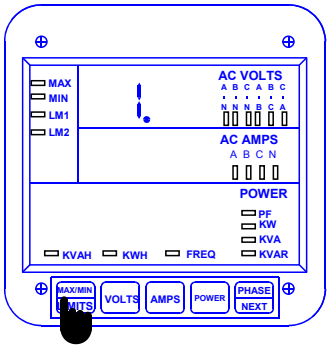
CT Type	Full Scale
Direct Input	05.00 A
600/5	0600 A
1000/5	1000 A
2000/5	2000 A
3000/5	03.00 KA
5000/5	05.00 KA

Also note that the meter reads with digital accuracy to a 2000 count range. Thus all CT and PT full scale settings in the meter should reflect that limitation. The table above shows the proper settings.

To change the Full Scale Settings:

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.

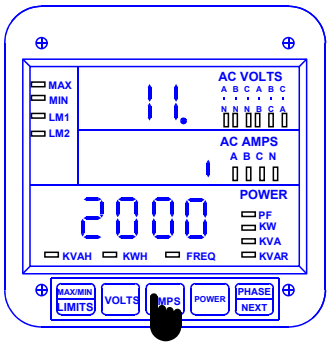


Step 1:

a. Enter Group Level of Programming Mode

(see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***1.*** appears in upper display.



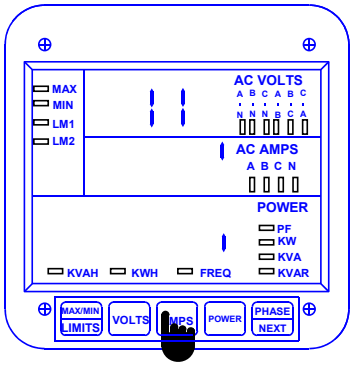
Step 2:

a. Press ***AMPS*** to activate the Group.

b. Press ***MAX/MIN/LIMITS*** until ***11.*** appears in upper display.

⇨ Middle display indicates Scale Factor Setting.

⇨ Lower display indicates Full Scale.



Entering the Scale Factor:

Step 3:

a. Press ***AMPS*** to begin Data Entry Sequence.

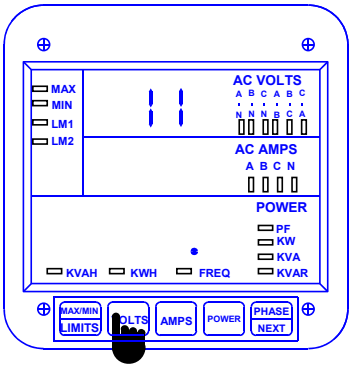
⇨ Lower display is replaced with a single dash.

b. Press ***VOLTS*** to move the segment UP or DOWN to set Scale Factor.

⇨ UP signifies - *Kiloamps*.

⇨ DOWN signifies - *Amps*.

c. Press ***AMPS*** to store.

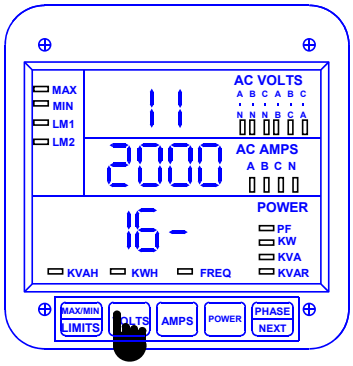


Decimal Point Selection:

Step 4:

a. Press ***VOLTS*** to move decimal point.

b. Press ***AMPS*** to store.



Step 5:

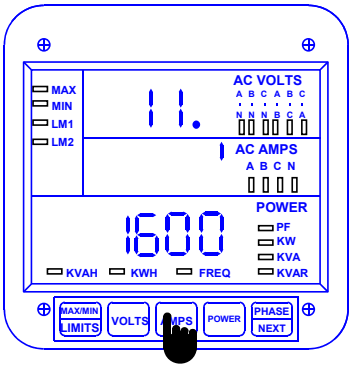
⇨ The Full Scale for current is indicated in middle display.

⇨ Four dashes appear in lower display.

⇨ Enter the four digit full scale.

Press ***VOLTS*** until the number appears.

b. Press ***AMPS*** to store.



⇨ Repeat this procedure until the value is entered.

⇨ Lower display indicates new Full Scale Setting.

⇨ Middle display indicates Scale Factor.

Group and Function Number appear (including a decimal point) in upper display.

10.3 Group 1, Function 2

- SCALE SELECTION AND DECIMAL PLACEMENT FOR WATTS -

Programming GROUP 1 also provides decimal positioning for maximum resolution. The following examples assist in selecting the best decimal position for FUNCTION *2*.

Shift the decimal left to increase resolution. Wattage should not exceed a numeral value of 2500. Shift the decimal one position right to decrease resolution.

Full Scale Wattage (FSW) is the product of FSV and FSA. For FSW for three phases multiply the FSW per phase by 3.

Example 1: Full Scale Voltage (FSV)=120 V

Full Scale Amperage (FSA)=5.00 A

FSW (one phase) =120 Vx5.00 A

FSW (one phase)=600 W

FSW (three phase)=600 Wx3 = 1,800 W

Here the FSW is too small a value for a Megawatt meter. FSW in the Kilowatt meter equals 1.800 KW. In FUNCTION *2*, four 9s appear. Place the decimal point after the first digit. The user cannot change the four digits. The user can only move the decimal point placement.

Example 2: 480/120 PT, 1000/5 CT

FSV=480 V

FSA=1000 A

FSW (one phase)=480 V · 1000 A

FSW (one phase)=480,000 W

FSW (three phase)=480,000 W · 3 = 1,440,000 W

FSW for a Kilowatt meter equals 1440. KW. FSW for a Megawatt meter equals 1.440 MW. In FUNCTION *2* place the decimal point after the last digit for a Kilowatt meter and after the first digit for a Megawatt meter. It is important to note which type of bezel labeling you have when making this decision.

Example 3: 14.4 KV/120, 1000/5 CT

FSV=14.40 KV

FSA=1000 A

FSW (one phase)=14,400 Vx1000 A

FSW (one phase)=14,400,000 W

FSW (three phase)=14,440, 000 Wx3 = 43,200,000 W

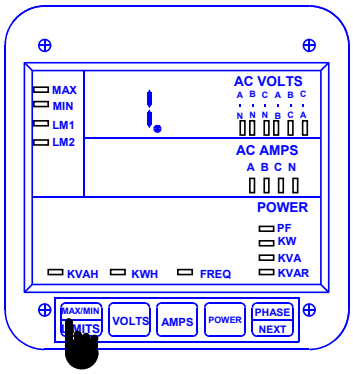
FSW for a Kilowatt meter equals 43,200 KW. Here the FSW is too large a value for a Kilowatt meter (the range is 000–2500). FSW for a Megawatt meter equals 043.2 MW. In FUNCTION *2*, place the decimal after the third digit.

In some applications where the load is normally very low, the watts resolution can be increased by moving the decimal point one position left.

To change the scale factor setting for wattage:

NOTE

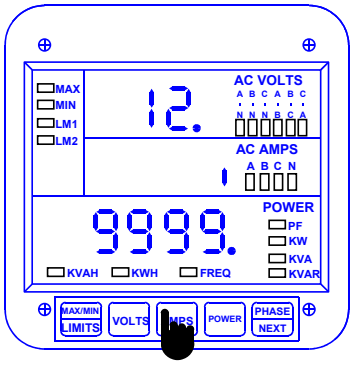
Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.



Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***1.*** appears in upper display.



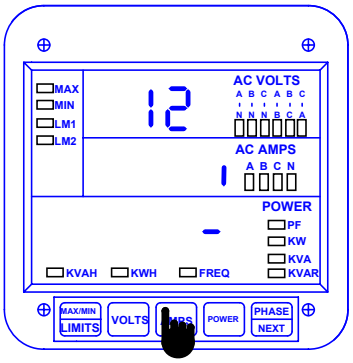
Step 2:

a. Press ***AMPS*** to activate the Group.

b. Press ***MAX/MIN/LIMITS*** until ***12.*** appears in upper display.

⇨ Middle display indicates current Scale Factor Setting.

⇨ Lower display indicates ***9999*** (including current decimal placement).



Entering the Scale Factor:

Step 3:

a. Press ***AMPS*** to begin Data Entry Sequence.

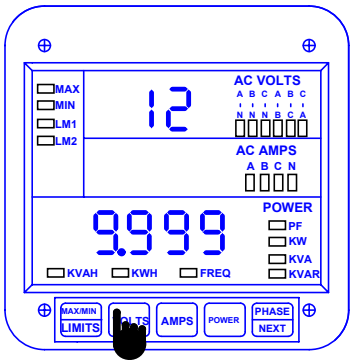
⇨ Lower display is replaced with a single dash.

b. Press ***VOLTS*** to move the segment

⇨ UP signifies - *megawatts*.

⇨ DOWN signifies - *kilowatts*..

c. Press ***AMPS*** to store.



Decimal Point Selection:

Step 4:

⇨ Display blanks and ***9999*** appears in lower display (including current decimal setting).

a. Press ***VOLTS*** to move decimal.

b. Press ***AMPS*** to store.

See Chapter 14 to Exit.

EPM 5300 Series Meters

Chapter 11: Programming Group 2 - Meter Calibration

WARNING

WARNING—READ THIS SECTION CAREFULLY BEFORE PROCEEDING:

- Any rescaling, such as a change in a transformer ratio, can be accomplished in GROUP 1. Calibration is not necessary.
- Meter calibration cannot be performed if the meter is installed for service. The sensing inputs must be connected to a power supply with variable voltage and separate current outputs.
- The calibration procedure requires highly accurate and stable input signals. Incorrect readings result from improper calibration procedures. If unsure, return unit to the factory for calibration.
- BEFORE calibrating any channel, make a note of its Full Scale Setting (see Chapter 10). Set the Full Scale in accordance with Table 10-2 for calibration. Restore original Full Scale Setting when calibration is completed.

11.1 Calibration Requirements

Calibration on the EPM 5300P requires precise inputs of 120 Volts, 5 Amps, and 2.5 Amps. The EPM 5300P -G model requires precise inputs of 300 Volts, 5 Amps, and 2.5 Amps. If this equipment is unavailable, contact us for assistance.

Table 11–1: Group 2 Programming Format

Group and Function Number	Function
20.	High End Calibration—Volts AN, BN, CN
21.	High End Calibration—Amps A, B, C
22.	Low End Calibration—Amps A, B, C
2E.	Exit Programming Group 2

The voltage and current scales are calibrated with the maximum range value 2000 for current, 14.40 for voltage, 300 for option G. The calibration value can be identical to the full scale value in GROUP 1, for better accuracy than the specification. However, if a full scale is ever changed to a higher value than the calibrated value, the value may be less accurate.

Table 11–2: Calibration Source, Full Scale and Value Settings for Calibration

Voltage Range	Input Source	Group 2 Value
69.3/120V	75V	1440
120/208V	120V L-N	1440
277/480V	300V	0300
5A CT High End	5A	2000
2.5A Low End	2.5A	1000

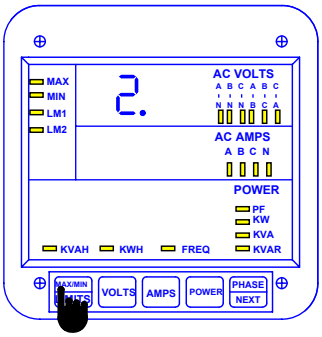
11.2 Group *2*, Functions 0–2

- HIGH END CALIBRATION OF VOLTAGE CHANNELS, HIGH AND LOW END CALIBRATION OF AMPERAGE CHANNELS -

To change the calibration (high end—Functions 0 and 1):

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.



Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

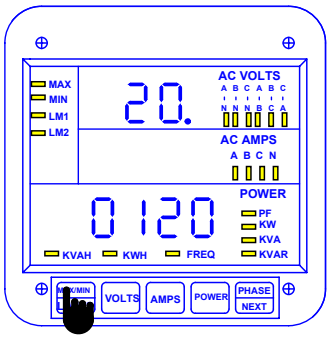
b. Press ***MAX/MIN/LIMITS*** until ***2.*** appears in upper display.

c. Press ***AMPS*** to activate the Group.

⇨A one-digit password is required to continue.

d. Press ***VOLTS*** until ***5*** appears.

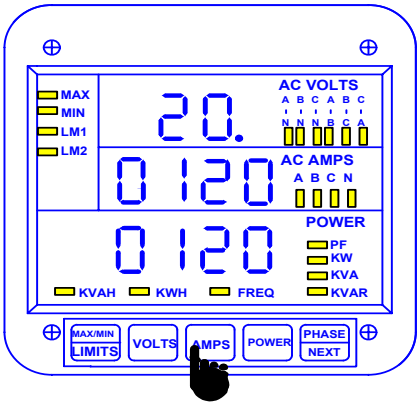
e. Press ***AMPS*** to select.



Step 2:

⇨ Refer to **Table 11-1** for Function Number that corresponds to the area requiring calibration. Calibration for each area begins with A and then moves to B and C.

a. Press ***MAX/MIN/LIMITS*** to change Function number.

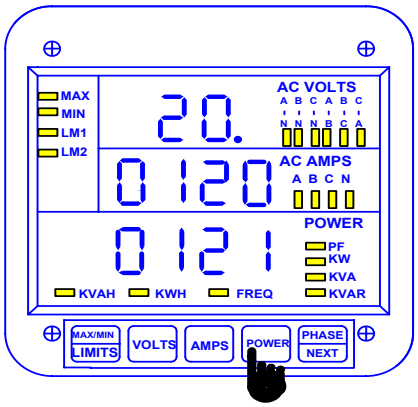


Step 3:

a. Press ***AMPS*** to activate calibration.

⇨ Digits move to middle display.

⇨ After a moment, digits appear in lower display also.



Step 4:

a. Press ***POWER*** to increase the value and ***PHASE/NEXT*** to decrease the value.

⇨ Digits in lower display disappear momentarily, then reappear indicating the new value.

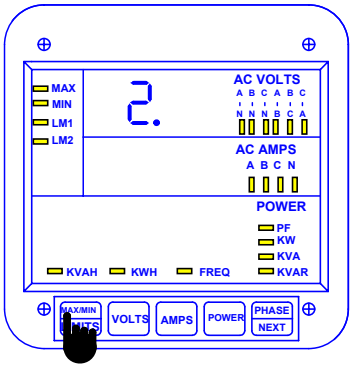
b. Press ***AMPS*** to store and move to the next phase or Amp within the group.

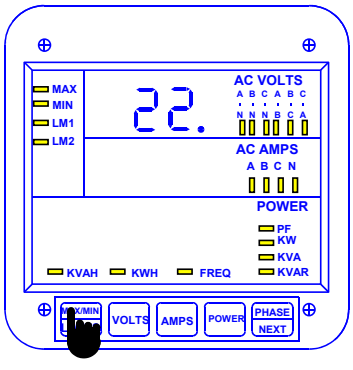
See Chapter 14 to Exit.

For Amps Low End (Function 2):

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.





Step 1:

a. Enter Group Level of Programming Mode

(see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until ***2.*** appears in upper display.

c. Press ***AMPS*** to activate the Group.

⇨ A one digit password is required to continue.

d. Press ***VOLTS*** until ***5*** appears.

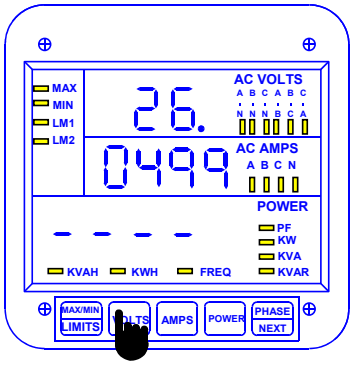
e. Press ***AMPS*** to select.

Step 2:

a. Press ***MAX/MIN/LIMITS*** until ***22.*** appears in upper display.

b. Press ***AMPS*** to activate. (Calibration begins with Amps A, then moves to B and C).

⇨ Middle and lower displays blank.



Step 3:

⇨ New value moves to middle display.

⇨ Lower display indicates the calibrated reading after 10-15 seconds.

⇨ To enter the half scale value in lower display,

a. Press ***VOLTS*** to select digits.

b. Press ***AMPS*** to store and proceed to B or C within the group.

c. Press ***MAX/MIN/LIMITS*** to end calibration procedure.

See Chapter 14 to Exit.

EPM 5300 Series Meters

Chapter 12: Groups 4, 5 and 6— Set Limits and Relays

The EPM 5300P -NL offers a comprehensive limit and set point functionality. The user can program above or below limits for every reading, including %THD. When a voltage or current measurement exceeds a particular value, the set limit is triggered and alerts the user. Each limit can trigger two internal Form C dry contact relays for alarm or secondary protection.

The EPM 5300P offers two set limit points available for each measured function: LM1 and LM2. Each limit can be set at any desired level. Note: The EPM 5200P does not have limit setting capability.

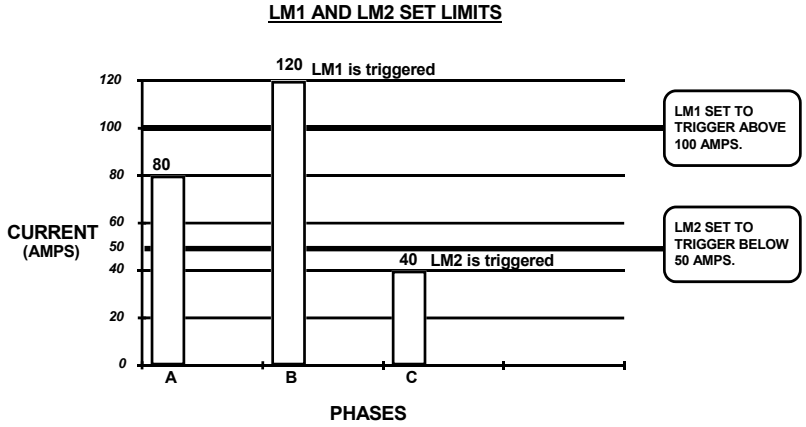


FIGURE 12–1: Example of LM1/LM2 Set Limits

12.1 Trip Relay

The EPM 5300P -NL has two relays. These relays are linked through the program to Set Limits LM1 and LM2. The user can program above or below set limits for every reading. When a measurement exceeds a particular value, the set limit triggers and alerts the user. Each relay is programmed to a separate delay time (see Chp. 10).

12.2 Time Delays & Relay Mode

Time Delay indicates whether a delay exists in the relay changing position. Relay Mode indicates whether the relay will act as a protective switch or not.

The Time Delay and Relay Mode are both located in GROUP 0, FUNCTIONS 4 & 5.

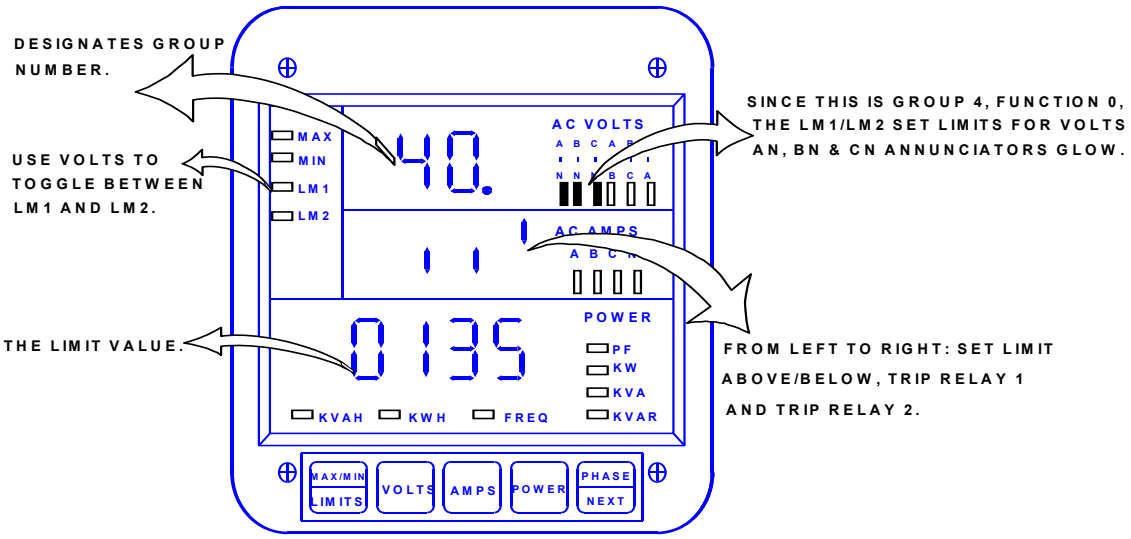
The following groups allow the user to program limits and relays

Group 4: Volts/amps Set Limits / Relays

GROUP 4 contains LM1 and LM2 set limit values for voltage and amperage scales. This allows the user to program limits for the four following functions:

1. Volts phase-to-neutral
2. Volts phase-to-phase
3. Amps A, B, C
4. Amps neutral

12.3 Group 4: Functions 0–3—LM1/LM2 Set Limits



12.4 Group 4: Programming Format for Limit Condition

Table 12–1: Group 4 Programming Format

Group and Function Number	Function
40.	LM1/LM2 Set Limits for Volts AN, BN, CN
41.	LM1/LM2 Set Limits for Volts AB, BC, CA
42.	LM1/LM2 Set Limits for Amps A, B, C
43.	LM1/LM2 Set Limits for Amps Neutral
4E.	Exit Programming GROUP 4

These functions have a two-part entry:

Part 1:

The first switch sets the limit to trip either above or below the Limit Value.

The second switch sets whether Relay 1 will trip when the condition occurs.

The third switch sets whether Relay 2 will trip when the condition occurs.

Part 2:

The second part is the Limit Value.

Table 12–2: Group 4: Functions 0–3

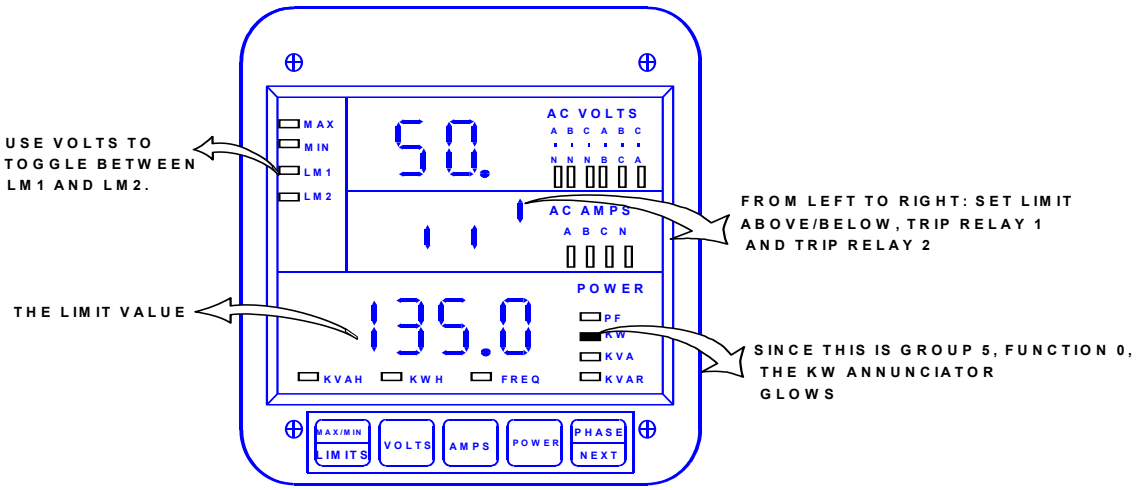
LM1 LED	LM2 LED	Above/below	Relay 1	Relay 2	Value
ON	OFF	Digit Up-trigger above value Digit Down-trigger below value	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-9999 0-9999
OFF	ON	Digit Up-trigger above value Digit Down-trigger below value	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-9999 0-9999

Table 12–3: Group 4: Example for Function 0

LM1 LED	LM2 LED	Above/below	Relay 1	Relay 2	Value
ON	OFF	Digit Up	Digit Up	Digit Down	0135
OFF	ON	Digit Down	Digit Down	Digit Up	0090

EXAMPLE: If voltages exceed 135 V, LM1 is triggered and Relay 1 is enabled. If the voltages fall below 90 V, LM2 is triggered and Relay 2 is enabled.

12.5 Group 5: Functions 0–7—LM1/LM2 Set Limits



GROUP 5 contains LM1 and LM2 set limit values for all power functions. This allows the user to program limits for the following functions: Kilowatt, Kilovar, Kilovolt-ampere, Power Factor, Frequency, negative Kilovar, negative Power Factor, and negative Kilowatt.

Table 12–4: Group 5 Programming Format for Limit Condition

Group and Function Number	Function
50.	LM1/LM2 Set Limits for Kilowatt
51.	LM1/LM2 Set Limits for Kilovar
52.	LM1/LM2 Set Limits for Kilovolt-ampere
53.	LM1/LM2 Set Limits for Power Factor
54.	LM1/LM2 Set Limits for Frequency
55.	LM1/LM2 Set Limits for Negative Kilovar
56.	LM1/LM2 Set Limits Negative Power Factor
57.	LM1/LM2 Set Limits for Negative Kilowatt
5E.	Exit Programming GROUP 5

There are 3 switches to set with limits:

1. Switch 1: Sets the limit to trip either above or below the Limit Value.
2. Switch 2: Sets whether Relay 1 will trip when the condition occurs.
3. Switch 3 :Sets whether Relay 2 will trip when the condition occurs.

After the switches are set, the limit value should be programmed (see table in section 12.4).

Table 12–5: Group 5: Functions 0–7

LM1 LED	LM2 LED	SWITCH 1 ABOVE/BELOW	SWITCH 2 RELAY 1	SWITCH 3 RELAY 2	VALUE
ON	OFF	Digit Up-trigger above value Digit Down-trigger below value	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-9999 0-9999
OFF	ON	Digit Up-trigger above value Digit Down-trigger below value	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-9999 0-9999

Table 12–6: Group 5: Example for Function 0

LM1	LM2	SWITCH 1	SWITCH 2	SWITCH 3	VALUE
ON	OFF	Digit Up	Digit Up	Digit Down	0120
OFF	ON	Digit Down	Digit Down	Digit Up	0090

Thus, if Kilowatts exceed 120 W, LM1 is triggered and Relay 1 is tripped.

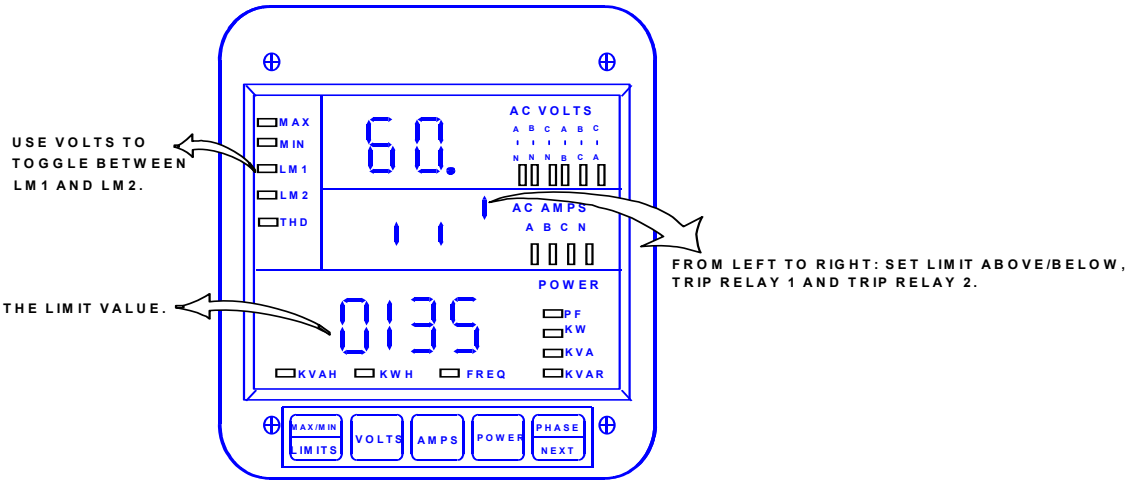
If the Kilowatts fall below 90 W, LM2 is triggered and Relay 2 is tripped.

Special Cases

FREQUENCY: FUNCTION *4* contains a permanent decimal after the *second* digit. The highest and lowest level limits that can be programmed are ***99.99*** and ***00.00***, respectively.

POWER FACTOR: FUNCTIONS *3* and *6* contain a permanent decimal after the *first* digit. The highest and lowest limits that can be programmed are ***1.000*** and ***0.000***, respectively.

12.6 Group 6: LM1/LM2 Set Limits:



12.6.1 *Group 6: THD Set - Limits / Relays (For Option -h)*

GROUP 6 contains LM1 and LM2 set limits for THD. These allows the user to program limits for the following functions: THD Volts AN, BN, CN, Amps A, Amps B, and Amps C.

Table 12–7: Group 6 Programming Format For THD Limit Conditions

Group and Function Number	Function
60.	THD Volts AN
61.	THD Volts BN
62.	THD Volts CN
63.	THD Amps A
64.	THD Amps B
65.	THD Amps C
6E.	Exit Programming GROUP 6

Table 12–8: Group 6 Functions 0–5

LM1 LED	LM2 LED	SWITCH 1 ABOVE/BELOW	SWITCH 2 RELAY 1	SWITCH 3 RELAY 2	VALUE
ON	OFF	Digit Up-trigger above level Digit Down-trigger below level	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-999.9 0-999.9
off	on	Digit Up-trigger above level Digit Down-trigger below level	Digit Up-enabled Digit Down-disabled	Digit Up-enabled Digit Down-disabled	0-999.9 0-999.9

12.7 Group 6: Functions 0–5—LM1/LM2 Set Limits and Relay Triggers for Over/Under %THD Conditions

Table 12–9: Group 6—Example for Function 0

LM1 LED	LM2 LED	Switch 1 Above/Below	Switch 2 Relay 1	Switch 3 Relay 2	Level
ON	OFF	Digit Up	Digit Up	Digit Down	012.0
OFF	ON	Digit Down	Digit Down	Digit Up	009.0

So, if THD exceeds 12%, LM1 is triggered and Relay 1 is enabled.

If THD falls below 9%, LM2 is triggered and Relay 2 is enabled.

12.8 Limits or Relays Programming Procedure

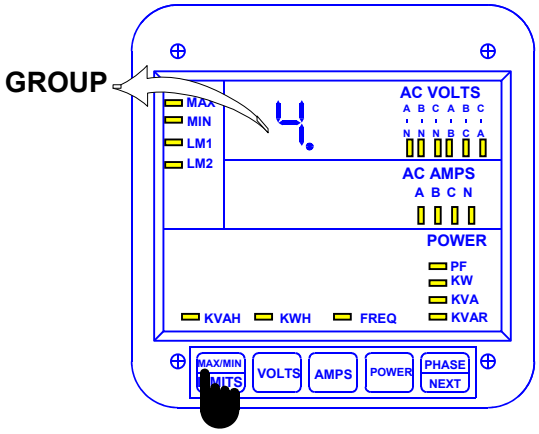
NOTE

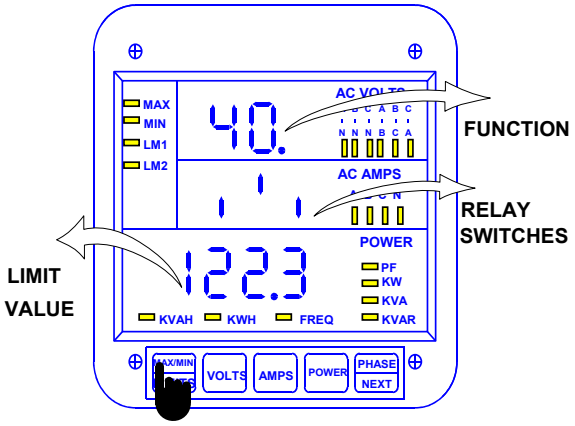
The procedure for programming any limit or relay for each group is identical. The example below signifies the exact procedure for programming a Limit/Relay for GROUPS 4–6.

—Group 4 is used as an example.

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.





Step 1:

a. Enter Group Level of Programming Mode

(see Chp. 8).

b. Press ***MAX/MIN/LIMITS*** until **4.** appears in upper display.

c. Press ***AMPS*** to activate the Group.

Step 2:

a. Press ***MAX/MIN/LIMITS*** to select desired Function.

⇨ Middle display provides the currently selected value for whether to trip *above* or *below*, activate Relay 1 and activate Relay 2.

Left Switch: UP position indicates above tripping value for lower display's value. DOWN position indicates below tripping.

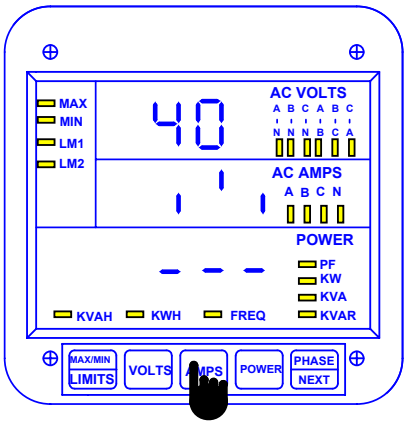
Middle Switch: UP position sets Relay 1 to trip.

DOWN position doesn't activate Relay 1 when limit condition exists.

Right Switch: Same as Middle Switch , regarding Relay 2.

b. Press ***VOLTS*** to toggle between LM1 and LM2 settings.

⇨ The LM1 or LM2 annunciator indicates the limit being displayed.

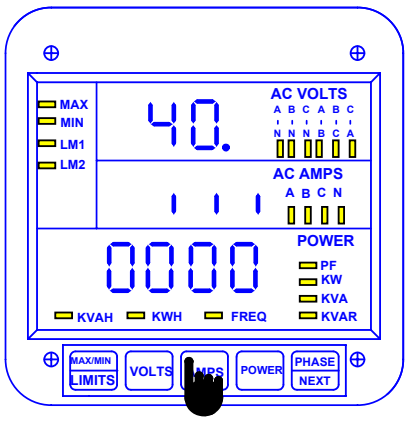


Step 3:

a. Press ***AMPS*** once.

⇨ Lower display is replaced with three dashes.

⇨Follow this step for **DISABLING LIMITS**:



Step 4:

a. Press ***AMPS*** once to Disable the Limit.

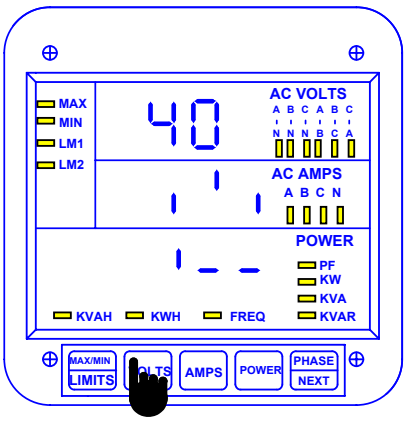
⇨ The display blanks momentarily, then the disabled settings appears in middle and lower displays.

⇨ The *Set Above/Below* will be set to below.

⇨ *Trip Relay 1* will be disabled.

⇨ *Trip Relay 2* will be disabled.

⇨ The *Setup Level* will be set to 0000.



Step 5:

a. Press ***VOLTS*** to change current Set Above/Below, Trip Relay 1, and Trip Relay 2 settings.

⇨ This toggles the segments UP (above limit) or DOWN (below limit).

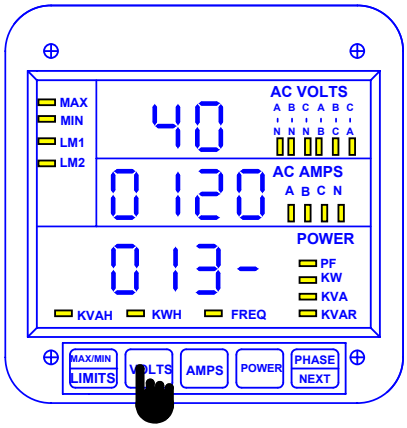
b. Press ***AMPS*** to store.

c. Press ***VOLTS*** to toggle the second segment UP (enable Relay 1) or DOWN (disable Relay 1).

d. Press ***AMPS*** to store.

e. Press ***MAX/MIN/LIMITS*** to proceed to entering the limit value.

f. Press ***AMPS*** to store.



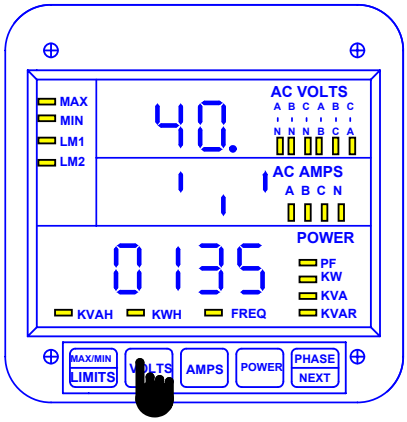
Step 6:

a. Press ***VOLTS*** to scroll through digits.

b. Press ***AMPS*** to select.

c. At the last digit, press ***AMPS*** twice to store limit programming.

⇨ Wait 3 seconds and the display updates with the new programming value.



Step 7:

a. Press ***VOLTS*** to program the other limits and repeat this procedure.

b. Press ***MAX/MIN/LIMITS*** TO PROGRAM ANOTHER Function (refer to Step 2).

See Chapter 14 to Exit.

EPM 5300 Series Meters

Chapter 13: Phase Reversal and Phase Imbalance Set Limits/Relays

13.1 Phase Reversal and Phase Imbalance

The set limit alerts the user of an unbalanced or a reversed phase in a Three-phase System. The EPM 5300P has two options for this purpose. The standard set-up is clockwise ABC rotation. Counterclockwise CBA rotation can be selected in GROUP 03.1, Switch C UP.

PHASE REVERSAL: Activates when a reversed phase enters the EPM 5300P's metering system.

PERCENT PHASE IMBALANCE: Activates when the user's preset value percent phase imbalance is exceeded. For example: an unbalanced Three-phase System.

Note: The EPM 5200P does not have this capability.

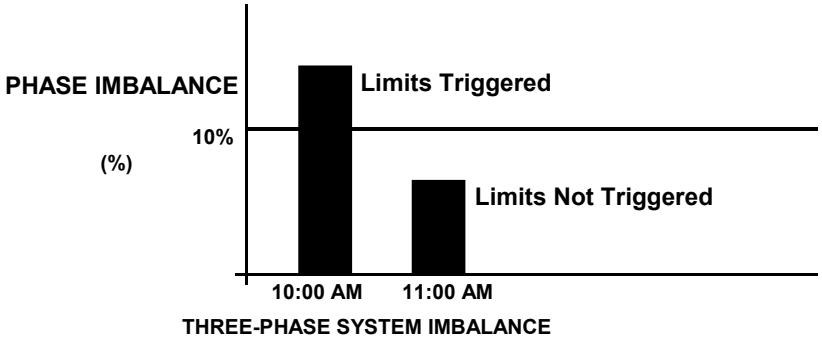


FIGURE 13–1: Example of Set Limits

13.2 Trip Relay

All information pertaining to Trip Relays 1 and 2 applies only to a meter with the –NL option.

The unit has two relays linked through the program to LM1 and LM2 Set Limits. The relay outputs can be programmed individually to close when LM1 and/or LM2 is triggered. Each relay has provisions for a separate delay (see Chapter 12).

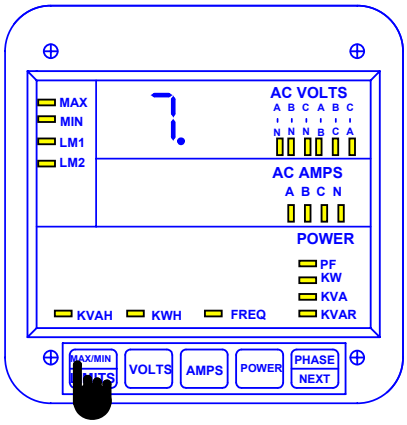
①TRIP RELAY 1	Whether to trip Relay 1.
②TRIP RELAY 2	Whether to trip Relay 2.
③LEVEL	The level at which the warning mechanism trips percentage of voltage imbalance.
④ENABLE/DISABLE	In the event of Phase Reversal, whether to enable or disable Phase Reversal Detection.

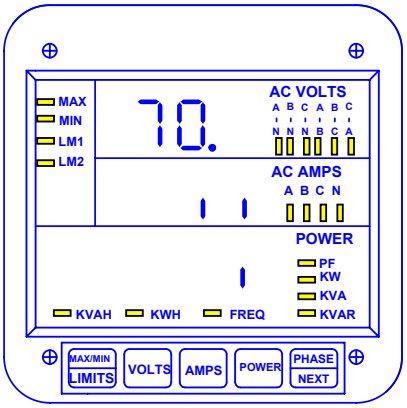
13.3 Group 7, Function 0—Voltage Phase Reversal Detection

Table 13–1: Group 7 Programming Format

Group and Function Number	Function
70.	Voltage Phase Reversal Detection
71.	Voltage Phase Imbalance
7E.	Exit Programming GROUP 7

To change the phase reversal setting:





Step 1:

a. Enter Group Level of Programming Mode (see Chp. 8).

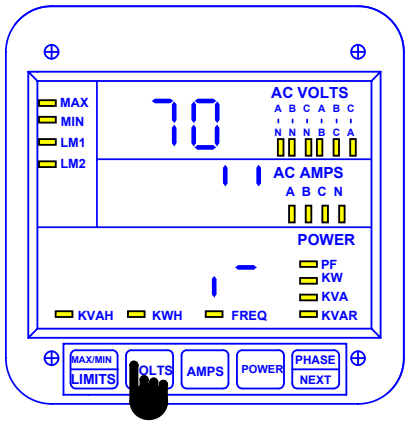
⇨ ***70.*** appears in upper display.

b. Press ***MAX/MIN/LIMITS*** until ***7.*** appears in upper display.

⇨ Middle display indicates current settings for Trip Relay 1 and Trip Relay 2.

c. Press ***AMPS*** to activate the Group.

⇨ Lower display indicates current setting for Enable/ Disable Phase Reversal Detection.



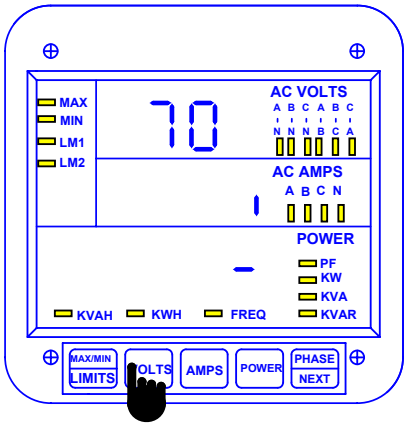
Step 2:

a. Press ***AMPS*** once.

⇨ Lower display is replaced with two dashes.

b. Press ***VOLTS*** to toggle the first segment UP (enable Relay 1) or DOWN (disable Relay 1).

c. Press ***AMPS*** to select. (*Repeat procedure for second segment-Relay 2*).



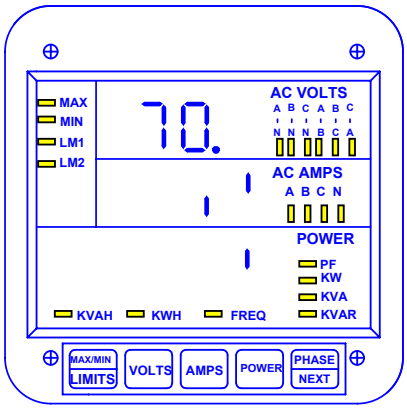
Step 3:

⇨ Middle display is replaced with current Phase Reversal Setting.

⇨ Lower display is replaced with a single dash.

a. Press ***VOLTS*** to toggle the segment UP (enable Phase Reversal Detection) or DOWN (disable detection).

b. Press ***AMPS*** to store.



⇨ Middle and Lower display indicate FUNCTION *0* settings.

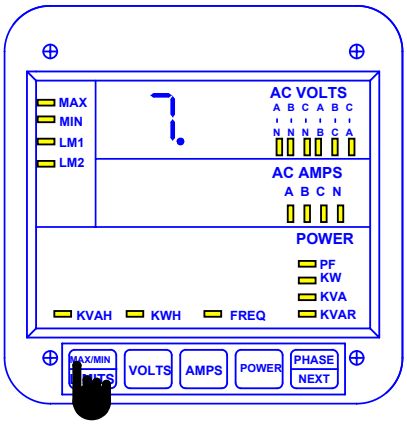
See Chapter 14 to exit.

13.4 Group 7, Function 1—Percentage Voltage Phase Imbalance

To change the percentage voltage phase imbalance:

NOTE

Press **MAX/MIN/LIMITS** at any time to cancel before storing the last digit or switch.

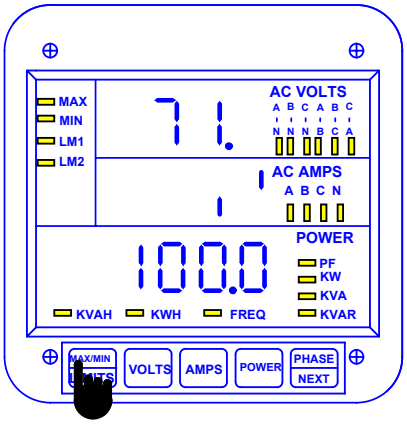


Step 1:

a. Enter Group Level of Programming Mode (see Chp. 9).

b. Press ***MAX/MIN/LIMITS*** until **7.** appears in upper display.

c. Press ***AMPS*** to activate the Group.

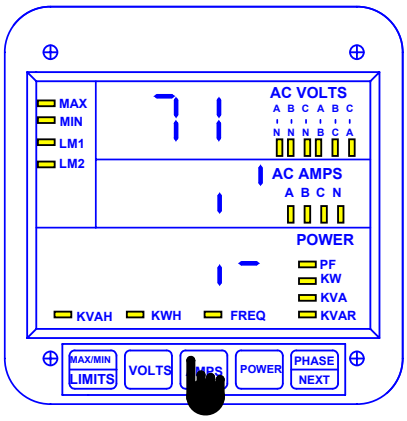


Step 2:

a. Press ***MAX/MIN/LIMITS*** until **71.** appears in upper display.

⇨ Middle display indicates the Trip Relay 1 and Trip Relay 2 settings.

⇨ Lower display indicates the percentage of Voltage Phase Imbalance.



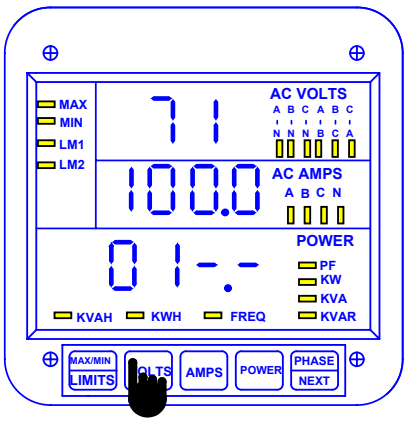
Step 3:

a. Press ***AMPS*** to begin Data Entry Sequence.

⇨ Lower display is replaced with two dashes.

b. Press ***VOLTS*** to toggle the first segment UP (enable Relay 1) or DOWN (disable Relay 1).

c. Press ***AMPS*** to store.



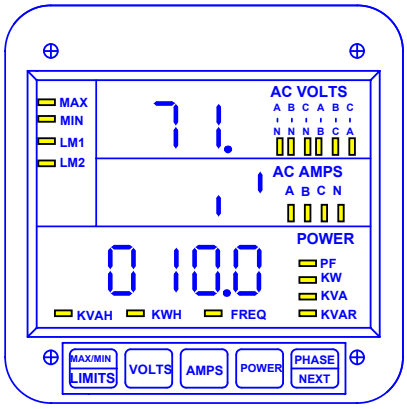
Step 4:

⇨ Middle display indicates the current percentage of Voltage Phase Imbalance.

⇨ Four dashes appear in lower display.

a. Press ***VOLTS*** to scroll through digits.

b. Press ***AMPS*** to select desired digit.



⇨ Middle and lower displays indicate new settings.

See Chapter 14 to Exit.

EPM 5300 Series Meters

Chapter 14: Exiting Programming Mode

14.1 Exiting Programming Mode

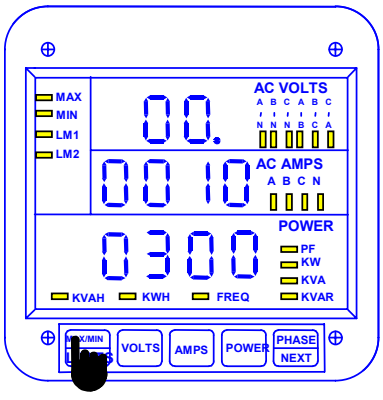
NOTE

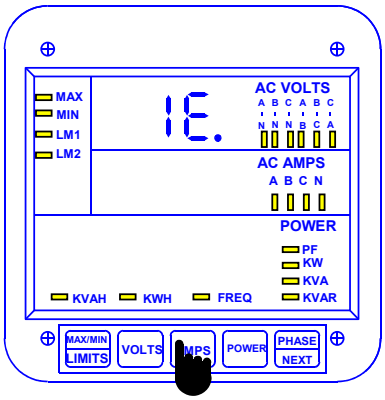
Steps to exit Programming Mode vary depending on the programming stage.

Exiting the Programming Mode is **always** necessary to store any new changes and to calculate a new checksum. Failure to exit results in a checksum error: the display blanks and the max LED flashes.

IF YOU ARE LOCATED IN A **FUNCTION Level—begin at Step 1.**

IF YOU ARE LOCATED IN A **GROUP Level—begin at Step 2.**



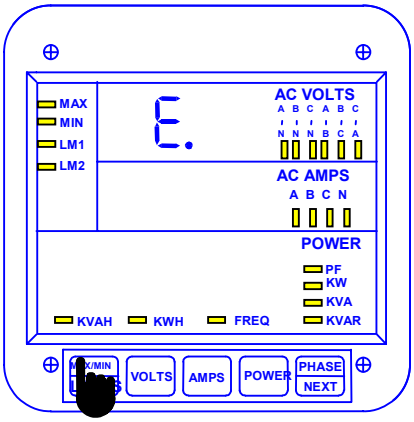


Step 1:

EXITING FROM FUNCTION LEVEL

a. Press ***MAX/MIN/LIMITS*** until the Group number in upper display is followed by ***E*** (for Exit).

⇨ The meter returns to Function Level.



Step 1a.:

a. Press ***AMPS*** to exit from Function Level to Group Level.

Step 2:

EXITING FROM GROUP LEVEL

a. Press ***MAX/MIN/LIMITS*** until ***E.*** appears in upper display (for Exit).

b. Press ***AMPS*** to exit entirely from Programming Mode.

EPM 5300 Series Meters

Chapter 15: Programming Quick Reference

15.1 Entering the Programming Mode

- ▷ Hold *PHASE/NEXT* key and press *AMPS* key.
  Display blanks and shows either a '0', '1', or '3'.
- ▷ If '3' is not displayed, press *AMPS* key until '3' is displayed.
- ▷ Release *AMPS* key
- ▷ Press *PHASE/NEXT* key, while '3' is still displayed.
  Display shows '333' momentarily.
  Upper display starts counting.
- ▷ Press *PHASE/NEXT* key when '5' is displayed to register the '5'.
- ▷ Repeat step 6 until '555' has been registered.

15.2 Data Entry Sequence

- ▷ At programmable numerical fields or Switch Pack fields, Press *AMPS* key to begin Data Entry Sequence.
  The current setting moves to middle row of display and dashes appear in the bottom row.
- ▷ Press *VOLTS* key to toggle between available choices.
- ▷ When a correct choice is selected, press *AMPS* key to store.

15.3 Programming Groups

Programming groups	Description
0	Global Meter Setup—Integration Interval, Meter Address, Communication Setting, Relay Settings
1	Full Scale Settings. Voltage Full Scale, Current Full Scale and Power Function Full Scale.
2	Meter Calibration
3	Calibration Ratios
4	Volts and Current Limits
5	Power Function Limits
6	THD Limits
7	Imbalance Reversal Limits
8	DC Output Calibration

15.3.1 Group 0: Global Meter Setup

00. Interval.

01. Meter Address for Communication.

02. Baud Rate for Communication.

03. System Configuration Switch Packs.

030. *Reserved Switches.*

031.

A Blank Non Significant Leading Zeros

B Reset Protection

C Phase Reversal Rotation Selection

D Open Delta Configuration

032.

A Instantaneous/Average Limit

B Power Factor Polarity

C Modbus Options

D Protocol Selection

033.

A Computer Control Relay 1

B Computer Control Relay 2

C Communication Selection

D DC-Output/Print Control

04. Relay 1 Programming

04P.

A Imb/Rev Selection

B And/or Logic

C Relay Control Selection

D Relay Control Selection

040. ON to OFF delay time

041. OFF to ON delay time

05. Relay 2 Programming 05P.

A Imb/Rev Selection

B *Reserved*

C Relay Mode Selectio

D Relay Mode Selection

050. ON to OFF delay time

051. OFF to ON delay time

06. KYZ Programming

06P. Pulse Factor Programming

060. KYZ Port 0 Function Mapping

061. KYZ Port 1 Function Mapping

062. KYZ Port 2 Function Mapping

07. Number of Phases

15.3.2 Group 1: Full Scale Setup

10. Volts Full Scale

11. Currents Full Scale

12. Power Full Scale

15.3.3 Group 2: Calibration

20. Volt AN, BN, CN

21. Amp A, B, C (High End)

22. Amp A, B, C (Low End)

15.3.4 Group 3: Calibration Ratios

30. Volt AN
31. Volt BN
32. Volt CN
33. Amp A (High-End Ratios)
34. Amp B (High-End Ratios)
35. Amp C (High-End Ratios)
36. Amp A (Low-End Ratios)
37. Amp B (Low-End Ratios)
38. Amp C (Low-End Ratios)

15.3.5 Group 4: Volt/Current Limits

40. Volt AN, Volt BN, and Volt CN Limits.
41. Volt AB, Volt BC, and Volt CA Limits.
42. Amp A, Amp B, and Amp C Limits.
43. Amp N Limits.

15.3.6 Group 5: Power Function Limits

50. +Watt Limits
51. +VAR Limits
52. VA Limits
53. +PF Limits
54. Frequency Limits
55. –VAR Limits
56. –PF Limits
57. –Watt Limits

15.3.7 Group 6: THD Limits

60. Volt AN THD Limits
61. Volt BN THD Limits
62. Volt CN THD Limits
63. Amp A THD Limits
64. Amp B THD Limits
65. Amp C THD Limits

15.3.8 Group 7: Imbalance/Reversal Limits

70. Detect Reversal

71. Imbalance percent Limit

15.3.9 Group 8: DC output Calibration

8P. Switch Packs

8P0.

A 75 Volts Suffix Selection

B 300 Volts Suffix Selection

C Frequency

D 10 Channel Selection

8P1. Power Uni/Bi Directional Selection

A Port 0

B Port 1

C Port 2

D Port 3

8P2. Power Uni/Bi Directional Selection

A Port 4

B Port 5

C Port 6

D Port 7

8P3. Power Uni/Bi Directional Selection

A Port 8

B Port 9

C *Reserved*

D *Reserved*

80. DC output Port 0

80F. Parameter Mapping

80L. Low-End Calibration

80H. High-End Calibration

81. DC output Port 1

81F. Parameter Mapping

81L. Low-End Calibration

81H. High-End Calibration

89. DC output Port 9

89F. Parameter Mapping

89L. Low-End Calibration

89H. High-End Calibration

KEY DESIGNATIONS

MAX/MIN/LIMITS	— Scroll Groups
	— Scroll Functions
VOLTS	— Scroll Packs
AMPS	— Enter/Exit Group
	— Enter/Exit

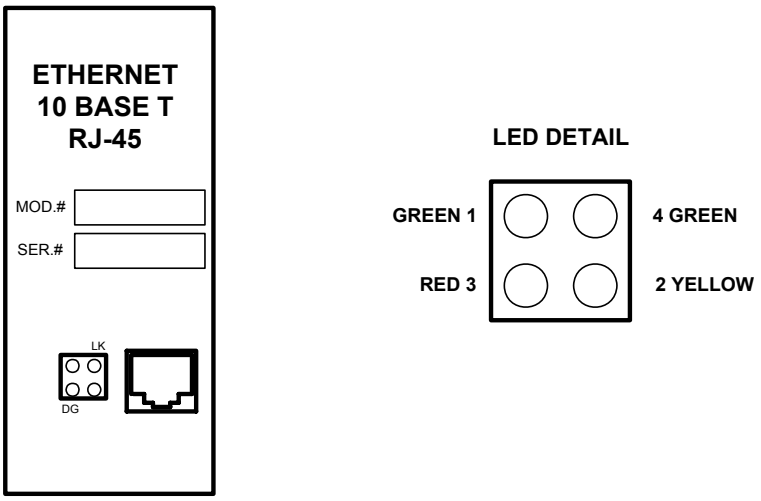
EPM 5300 Series Meters

Chapter 16: Ethernet Option

The EPM5350P, Meter with the Ethernet Option, has all the components of the standard Meter PLUS the capability of connecting to multiple devices over Ethernet. The Meter face is the same as the EPM5300P (except for the model number).

16.1 Ethernet Module

The Ethernet connection is made with a small module added to the back of the meter. This small but powerful module has simply an RJ-45 Port and four Status LEDs.



See the Table below for a description of the Status LED functions.

LED	Description	LED Functions
1	Serial Port (Channel) 1 Status	Lights solid green to indicate Channel 1 is IDLE. Blinks green to indicate Channel 1 is connected to the network and ACTIVE.
2	Serial Port (Channel) 2 Status	Lights solid yellow to indicate Channel 2 is IDLE. Blinks yellow to indicate Channel 2 is connected to the network and ACTIVE. (Not used by this device; reserved for future use)
3	Diagnostics	Blinks or lights solid red in combination with the green (Channel 1) LED to indicate DIAGNOSTICS and ERROR DETECTION. Red solid, green (Channel 1) blinking: 1x: EPROM checksum error 2x: RAM error 3x: Network controller error 4x: EEPROM checksum error 5x: Duplicated IP address on network* 6x: Software does not match hardware* Red blinking, green (Channel 1) blinking: 4x: Faulty network connection* 5x: No DCHP response received*
4	Network Link Status	Lights solid green to indicate network port is connected to the network.

* Non-fatal error

16.2 Ethernet Option Setup

This chapter covers the required steps to get the Ethernet Interface on-line and working. There is only one method used to log into the Ethernet Server and set up the IP address:

- Network Port Login: make a Telnet connection to the network port (9999).

It is important to consider the following points before logging into and configuring the Ethernet Interface:

- The Ethernet Interface's IP address must be configured before a network connection is available.
- Only one person at a time may be logged into the network port. This eliminates the possibility of several people trying to configure the Ethernet Interface simultaneously.

16.2.1 Default IP Address

The Ethernet Interface ships with a default IP address set to 0.0.0.0, whish automatically enables DHCP within the Ethernet Interface.

Provided a DHCP server exists on the network, it will supply the Ethernet Interface with an IP address, gateway address and subnet mask when the Ethernet Interface boots up. If not DHCP server exists, the Ethernet Interface will respond with a diagnostic error: the RED Diagnostic LED blinks continuously and the GREEN Status LED blinks five times.

16.2.2 AutoIP

Auto IP allows an Ethernet Interface to obtain an address in a network that does not have a DHCP server. (Windows 98 and 2000 also support AutoIP.)

AutoIP assigns a random valid address to the Ethernet Interface in the range of 169.254.x.1 to 169.254.x.1 (x can be between 0 and 255). This range of IP addresses is not to be used over the Internet. If the Ethernet Interface has not been configured manually and cannot find a DHCP server, it automatically chooses an address from the reserved range. The Ethernet Interface then uses the Address Resolution Protocol (ARP) to send out a request asking if any node is using that address. If another node is using the same address, the Ethernet Interface assigns another IP address, reboots and repeats the sequence.

AutoIP-enabled Ethernet Interfaces are constantly looking for DHCP servers. If a DHCP server becomes available on the network, the AutoIP-enabled Ethernet Interface switches to the DHCP server-provided address and the unit reboots. If the DHCP server exists but denies the Ethernet Interface an IP address, the Ethernet Interface does not attach to the network, but waits and retries.

AutoIP allows a small network of AutoIP-enabled devices to be set up without any need for a DHCP server or static IP addresses.

AutoIP can be disabled be setting the IP address to 0.0.1.0. The 1 in the third octet is the disabling factor.

16.2.3 Setting the IP Address

The Ethernet Interface's IP address must be configured before a network connection is available. If the IP address was not set automatically via DHCP, set it now using a network and the setup (configuration) menu.

Network Port Login

The ARP method is available under UNIX and Windows-based systems. The Ethernet Interface will set its address from the first directed TCP/IP packet it receives.

ARP on UNIX

On a Unix host, create an entry in the host's ARP table using the intended IP address and the hardware address of the Ethernet Interface, which is found on the product label.

```
arp –s 191.12.3.77 00:20:4a:xx:xx:xx
```

ARP ON WINDOWS

In order for the ARP command to work on Windows, the RP table on the PC must have at least one IP address defined other than its own. If the ARP table is empty, the command will return an error message. Type ARP –A at the DOS command prompt to verify that there is at least one entry in the ARP table.

If the local machine is the only entry, ping another IP address on your network to build a new entry in the ARP table; the IP address must be a host other than the machine on which you are working. Once there is at least one additional entry in the ARP table, use the following command to ARP the IP address to the Ethernet Interface:

```
arp –s 191.12.3.77  00-20-4a-xx-xx-xx
```

Telnet to Port 1

Now open a Telnet connection to Port 1. The connection will fail quickly (3 seconds). But the Ethernet Interface will temporarily change its IP address to the one designated in this step.

```
telnet  191.12.3.77  1
```

Telnet to Port 9999

Finally, open a Telnet connection to port 9999 and set all required parameters.

```
telnet  191.12.3.77  9999
```

This IP address is temporary and will revert to the default value when the Ethernet Interface's power is reset, unless you log into the Ethernet Interface and store the changes permanently.

16.2.4 Network Configuration

Certain parameters must be configured before the Ethernet Interface can function on a network. The Ethernet Interface can be locally or remotely configured using the following procedures:

Use a Telnet connection to configure the unit over the network. The Ethernet Interface's configuration is stored in nonvolatile memory (NVRam) and is retained without power. The configuration can be changed at any time. The Ethernet Interface performs a reset after the configuration has been changed and stored.

As mentioned above, to configure the Ethernet Interface over the network, establish a Telnet connection to port 9999. From the Windows Start menu, click Run and type the following command, where x.x.x.x is the IP address and 9999 is the Ethernet Interface's fixed network configuration port number.

telnet x.x.x.x 9999

Be sure to include a space between the IP address and 9999.

16.2.5 Configuration Parameters

After entering Setup Mode (confirm by pressing Enter), you an configure the parameters by entering one of the numbers on the Change Setup Menu, or you can confirm default values by pressing **Enter**. Be sure to store new configurations when you are finished. The Ethernet Interface will then perform a power reset.

Serial Number 5415404 MAC Address 00:20:4A:54:3C:2C

Software Version V01.2 (000719)

Press Enter to go into Setup Mode

1. Network/IP Settings:

Ethernet Interface Autodetect	
IP Address	- 0.0.0.0/DHCP (Customer Configurable)
Default Gateway	--- not set --- (Customer Configurable)
Netmask	--- not set --- (Customer Configurable)

2. Serial & Mode Settings:

Protocol	Modbus/RTU, Slave(s) attached (FIXED)
Serial Interface	9600,8,N,1,RS232,DB25 (must match meter) (FIXED)

3. Modem Control Settings:

DCD Output	Fixed High/Active
CTS Output	Fixed High Active

4. Advanced Modbus Protocol Settings:

Slave Addr/Unit Id Source	Modbus/TCP header (FIXED)
Modbus Serial Broadcasts	Disabled
Character, Message Timeout	00010 ms, 00500 ms

D) default settings, S) save, Q) quit without save;

select command or parameter set (1..4) to change: **I**

Baud Rate

The Ethernet Interface and attached serial device (the meter) must agree on a speed or baud rate used for the serial connection. Valid baud rates are 1200, 2400, 4800 and 9600 (default). For the EPM 5350P, default settings are **9600 baud rate, 8 data, 1 stop, no parity, Modbus RTU**.